SELF-LICENSING PROFESSIONS

By

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To my dad.

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TABLE OF CONTENTS

page

ACKNOWLEDGMENTS iv

LIST OF TABLES ix

LIST OF FIGURES xii

ABSTRACT xiii

CHAPTERS

I INTRODUCTION 1

Definition of Occupational Licensure 1
Purpose of Occupational Licensure 2
Plan of the Dissertation 4

II THEORETICAL MODELS OF OCCUPATIONAL LICENSURE 6

Akerlof's Lemons Market Model 9
Leland's Models 11
The Social Welfare Problem in a Lemons Market 11
The Social Welfare Problem in a Licensed Market 14
The Rent Maximizing Licensure Model 17
A Vintage Occupational Licensure Model 21
The Social Welfare Licensure Problem 30
The Rent Maximizing Problem 32
Maximizing Next Period's Average Quality 34
Maintaining Average Quality 36
The Average Quality Frontier 36
Comparative Statics 39
Social welfare 40
Rent seeking 44

Quality maximization 47
Quality maintenance 50
Comparative Statics Summary 50
Extensions of the Vintage Occupational Licensure Model 54
Conclusions 59

III EMPIRICAL EVIDENCE ON OCCUPATIONAL LICENSURE 62

Other Empirical Occupational Licensure Literature 62
Previous Empirical Research Using Pass Rate Data 64
Choice of Subject Group 67
Historical Patterns in the Legal Profession 72
Changes in the Pass Rate 81
Tests of the Vintage Occupational Licensure Models 86
Data definitions 86
Model 1 94
Model 2 109
Model 3 122

Conclusions 126

IV CONCLUSIONS 129

APPENDICES 132
A DERIVATION OF COMPARATIVE STATIC RESULTS . . 132
B DATA SOURCES 135

REFERENCES 143

BIOGRAPHICAL SKETCH 148

LIST OF TABLES

Table		page
2.1	Notation	21
2.2	Comparison of the Four Total Quality Derivatives and Lower Bound Relation	37
2.3	Comparative Statics Summary for Changes in a_1 with Respect to Changes in the Parameters	51
3.1	Migration, Failure Rates, and Professional Income	65
3.2	Examination Requirements for Professions Regulated in the State of Florida, 1989-90	71
3.3	Per Capita Lawyer Population, National, 1890-1985	74
3.4	Total Number of United States Citizens Taking State Bar Examinations Per Million Population	76
3.5	Admissions by Examination, National, 1920-88	78
3.6	Ratio of Examinees to Lawyers, National, 1930-85	82
3.7	Florida's First Timers, Repeaters and their Pass Rates, 1940-1988	84
3.8	Average Pass Rate, National, 1932-1988	87
3.9	Description of Variables Used in Model 1	92
3.10	Regression Results from Model 1A, The Vintage Model Using AGE instead of PCTAGE	95
3.11	Regression Results from Model 1B, The Vintage Model Using PCTAGE instead of AGE	97
3.12	Variance Inflation Factors	99

3.13 Regression Results from Model 1C, The Vintage Model Using FEDCASES instead of Individual Federal Caseload Variables 101

3.14 Regression Results from Model 1D, The Vintage Model for 1940-70 103

3.15 Regression Results from Model 1E, The Vintage Model Using for 1980 104

3.16 Regression Results from Model 1F, The Vintage Model Using First Differences with the Pass Rate as the Dependent Variable 105

3.17 Regression Results from Model 1G, The Vintage Model Using First Differences with the Change in the Pass Rate as the Dependent Variable 107

3.18 Description of Variables Added in Model 2A 111

3.19 Regression Results from Model 2A, Adding Additional Variables 113

3.20 Variance Inflation Factors for Model 2A 114

3.21 Description of the Variable Added in Model 2B 115

3.22 Regression Results from Model 2B, Replacing COHORTS by APPBYCOH 117

3.23 Description of the Variable Added in Model 2C 118

3.24 Regression Results from Model 2C, Adding a Measure of Opportunity Costs 119

3.25 Regression Results from Model 2D, Using the WRATIO as the Dependent Variable 121

3.26 Summary of Variables Added in Model 3 123

3.27 Regression Results from Model 3, 2SLS Estimation of Simultaneous Equations 124

B.1 Data Sources 123

LIST OF FIGURES

Figure		Page
2.1	The Average Quality Frontier	37
3.1	Lawyer Population Per Million Population	75
3.2	Examinees Per Million Population, National, 1930-88	77
3.3	Exam Admissions Per Million Population, 1920-88	80
3.4	Ratio of Examinees Per Million Population to Lawyers, National, 1930-85	82
3.5	First-Timers' and Repeaters' Pass Rates on Florida's Legal Entrance Exams, 1940-1989	85
3.6	Average Aggregate National Pass Rates, 1932-1988	89

Abstract of Dissertation Presented to the Graduate School
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SELF-LICENSING PROFESSIONS

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This dissertation considers whether a social welfare, a rent seeking, a quality maximizing or a quality maintenance model best describes the behavior of self-licensed professions. Specifically, are the entry barriers set in the interest of society as a whole, in the interest of the professionals, or to achieve a particular quality goal? To answer this question, I first compare the qualities and quantities of professional services arising under the four hypotheses. I then investigate empirical evidence to see which model offers a better explanation of how licensure actually operates. Findings should surprise critics of self-licensed professions: the social welfare model applies best.

To characterize the differences between the four models, I develop a two-period model in which new entrants of differing qualities arrive in each period. Consumers cannot directly observe quality so the model features asymmetric

information. I derive the socially optimal entry restrictions and compare them (1) to the restrictions that professionals already in practice would impose to maximize their own utility, (2) to the restrictions chosen to maximize the average quality of the profession, and (3) to the restrictions chosen to maintain the average quality of the profession. This vintage occupational licensure model shows that three variables have testable implications and can be used to distinguish the professions' behavior.

On an empirical level, I examine entry into one profession, the legal profession, asking whether the predicted relationships between the pass rates and the three testable variables can support one model over the others. Regressing state bar exam pass rates on measures of demand, age, and the number of applicants I find, contrary to most other published papers, evidence that the data is most consistent with a social welfare model. Strong time series evidence that the pass rate has risen over time further strengthens support for the social welfare model.

CHAPTER I
INTRODUCTION

Licensed professions have been of interest to generations of economists because we imagine their behavior fits our classic cartel models. However, on the theoretical level, little has been written on occupational licensure. And empirically, although many economists have gathered evidence which supports the cartel claims, not all of it is conclusive, nor have all the data been explored. The purpose of this dissertation is to develop a new theoretical model of licensed professions and to test this model using various new data collected for the period 1940 to 1988.

Definition of Occupational Licensure

For the purposes of this thesis, I define licensed professions as those which restrict entry by requiring potential entrants to pass an examination and meet other profession-specific requirements before receiving a license. The examination requirement distinguishes licensure from the other two forms of labor regulation: certification and registration. Certified professionals such as accountants voluntarily take exams to obtain quality certifications. Registered professionals such as taxicab

drivers do not screen with exams at all.[1] In sum, licensure restricts entry and the other two forms of labor regulation do not.

Purpose of Occupational Licensure

The stated purpose of the examination requirement is to insure that new entrants into the professions meet a minimum quality standard. Yet, practically, once a profession possesses the right to restrict entry to maintain quality, it is hard to believe that it will not also use this right to maximize its income.

Legal challenges to the professions' rights to restrict entry on the basis of monopoly practices have been defeated.[2] However, these legal decisions are predicated on the assumption that entry barriers only protect quality. The court argues in United States v. American Medical Association, "the licensed monopolies which professions enjoy constitute, in themselves, severe restraints upon competition. But they are restraints which depend upon capacity and training, not special

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[1] Unfortunately, this standard definition is not uniformly applied to the professions. For example, I would define physician's assistants as licensed professions since they are required to pass a national examination administered by the National Commission on Certification of Physician's Assistants, Inc. However, as the name of the testing organization suggests, they refer to themselves as certified.

[2] American Medical Association v. U.S., 130 F. 2d 233, 76 U.S. App. D.C. 70, (D.C. Cir. 1942). Cert. granted, Medical Society of District of Colombia v. U.S. 317 U.S. 613, S. Ct. 44, 87 L.Ed. 497 (U.S. 1942); Cert. granted, American Medical Association v. U.S., 317 U.S. 613, 63 S. Ct. 44, 87 L. Ed. 498 (U.S. 1942). Affirmed by American Medical Association v. U.S. 317 U.S. 519 63 S. Ct. 326, 87 L. Ed. 434 (U.S. 1943).

privilege."[3] If the licensed professions limited their entry barriers to examinations, the argument is plausible. However, the professions also impose ad hoc exclusionary rules which are unrelated to applicant quality. Consider the case of physicians. Physicians are required to master a well-specified body of knowledge, independent of what state they choose to live in. Their entrance exam is written and administered on a national level by the Federation of State Medical Boards of the United States.[4] Therefore, if a physician passes the exam, he establishes that he meets the minimum quality standard and should be given courtesy admission in all other states. Nevertheless, no state offers automatic courtesy admissions. The states that do allow courtesy admissions only do so if the physician's home state reciprocates[5] and they often limit their courtesy admissions by imposing additional rules and large fees.[6]

Similarly, all health-related professions, not only physicians, must master well-specified bodies of knowledge, independent of what state they choose to live in. Why is it that some health-related professions required state specific exams? How can dentists' required knowledge differ from Florida[7] to Wyoming?[8] One explanation is that the states create different exams because they all have different quality

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[3] American Medical Association v. U.S., 130 F. 2d 233, 76 U.S. App. D.C. 70, (D.C. Cir. 1942). at 246.

[4] FL. Stat. § 458.311.

[5] WY. Stat. § 33-26-306.

[6] Id.

[7] FL. Stat. § 466.006 (4ab).

[8] WY. Stat. § 33-15-122.

standards. Alternately, different states may have developed different levels of influence over the selection process of new entrants and as a consequence different levels of monopoly power, if professions behave as monopolists. In any case, the different examination requirements are a peculiar feature of licensed professions making them interesting to study.

Loyalty oaths provide a third example of an ad hoc exclusionary rule which is unrelated to applicant quality. The case of Sara Baird, which was overturned in Baird v. State Bar of Arizona in 1971, is one example of this type of exclusionary practice.[9] Sara Baird was denied admission into the Arizona Bar, even though she passed the examination, because she refused to state whether or not she had ever been a member of the Communist Party or any organization "that advocates overthrow of the United States Government by force or violence." Such loyalty oaths, however, are likely politically oriented instead of being created for purposes of limit the quantity of new professionals as such. Nonetheless, loyalty oaths restrict entry on a basis unrelated to applicant quality thus do not satisfy the legal argument which sustains the professions' rights to restrict entry.

Plan of the Dissertation

It is evident that licensure rules go beyond their stated purpose of maintaining professional quality and allow professions to maximize income. However, it is not

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[9] Baird v. State Bar of Arizona, 401 U.S. 1, 91 S.Ct. 702, 27 L.Ed.2d 63, (U.S., 1971).

clear if licensed professions also use their entrance exams for maximizing income or if the examinations only function to preserve quality. And if professions do choose quality to maximize their income, how does their optimal choice of quality compare to the quality which would have been chosen in a world directed by a social welfare maximizing social planner? To address this question, I develop a two-period model which allows applicants of differing qualities to arrive each period. Within this model, I derive the socially optimal entry restrictions and compare them to the restrictions that would result when self-regulated professions maximize their income. I also derive the entry restrictions for the problems of maintaining and maximizing average quality, the two objectives lawyers argue they pursue. I then determine the difference between the comparative static properties of these four problems and use these differences to distinguish between the four models empirically.

CHAPTER II

THEORETICAL MODELS OF OCCUPATIONAL LICENSURE

Market inefficiencies occur when any of the assumptions of the Arrow-Debreu[1] perfectly competitive market are violated. For the perfect information assumption to be valid, both buyers and sellers must be informed about all characteristics of the traded good. When we relax this assumption, we can develop models that consider the consequences of differences in knowledge about the traded goods.

Two common examples of markets with imperfect information are the markets for used cars[2] and insurance.[3] In used car markets, buyers are not informed about cars' reliability, whereas, in insurance markets, sellers are not informed about risks of the people they insure. Owners of good used cars are more likely to keep them

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[1] Debreu, G. (1959), The Theory of Value, New York: Wiley, and K. Arrow and F. Hahn (1970), General Competitive Analysis, San Francisco: Holden Day.

[2] Akerlof, George A. (1970), "The Market for "Lemons": Quality, Uncertainty and the Market Mechanism", Quarterly Journal of Economics, 84: 488-500.

[3] Rothschild, M. and J. E. Stiglitz (1976), "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," Quarterly Journal of Economics, 90: 629-649. Stiglitz, J. E. (1977), "Monopoly, Non-Linear Pricing and Imperfect Information: The Insurance Market," Review of Economic Studies, 44: 407-430.

while owners of bad used cars, lemons, are more likely to sell them. Inefficiencies arise since the average quality and price of used cars traded are lower than what is socially optimal. This could be avoided if buyers could induce sellers to reveal their private knowledge about the cars' mechanical histories. Similarly, inefficiencies arise in insurance markets when cautious drivers pay for the actions of daredevils and athletes pay for the behavior of couch potatoes. To counteract this, firms write insurance policies designed to induce people to reveal information about their relative riskiness and to give incentives to riskier people to purchase more insurance.

Markets of licensed professionals are similar to both used car and insurance markets because buyers are uninformed as to the quality of the professional's service. Licensed professions are typically modelled like lemons markets since buyers rarely design contracts to get professionals to reveal their quality information. Licensed professions differ from lemons markets, though, in terms of whether the highest or lowest quality is chosen. The critical question in used car markets is: which is the best car that will be sold? In markets for professional services, the key question is: what are the worst services that will be sold?[4] This is merely a technical point rather than a significant theoretical difference. In fact, if social welfare is modelled as a function of average quality and quality has a uniform distribution, there will be no difference between the lemons and the licensed markets. Nonetheless, in

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[4] This assumes there is no exit in the industry. If there is exit, we will also wonder about the quality of the best worker.

both cases, inefficiencies occur for the same type of reason: buyers lack complete information about quality.

There is a limited theoretical literature on licensed professions. The most well known paper is Hayne Leland's 1979 quacks model which is a one-period application of the lemons model to licensed professions. In this dissertation, I present a new two-period, vintage model of occupational licensure. My model is similar to Leland's model since I examine the social welfare implications of choosing the worst professional's quality through self-regulation versus government-regulation. My model differs from Leland's model, though, since my two-period model distinguishes between old and new professionals. This allows me to focus on the old professionals' profit which arguably is the correct objective function to pinpoint. In addition, there are other less significant differences in details of the models assumed for convenience in solving. Ultimately, the goal of this chapter is to derive a model which allows for testable differences between social welfare and rent maximizing models -- a feature which further distinguishes this dissertation from the existing literature. In turn, the purpose behind the subsequent empirical work is to test any theoretical differences which may arise.

In deriving this model, I examine the welfare implications of choosing the quality level of the worst professional from the perspective of a self-regulator versus a government-regulator. Before developing my own model, I first discuss the lemons market model developed by Akerlof and the licensure model developed by Leland

to provide a framework for my model as well as a benchmark from which to compare my results.

Akerlof's Lemons Market Model

George Akerlof's paper, "The Market for Lemons: Quality Uncertainty and the Market Mechanism,"[5] contains models of markets with symmetric and asymmetric information about the quality of a traded good. These models have two groups of people, sellers (group 1) and buyers (group 2) of some traded good whose quality varies and is uniformly distributed.

If we apply this paper to licensed professions, the model implicitly restricts sellers to own and sell a professional service, but not to produce it, nor to determine its quality themselves. Instead, their only choice is whether or not to sell the service. Quality is predetermined by external events beyond their control (genetics) and cannot be influenced by differences in effort.

To represent these two groups' preferences, Akerlof chooses two linear utility functions that differ in terms of the weight placed on the quality of the traded good. He defines the weight so the buyers' marginal valuation for quality exceeds the sellers' marginal valuation for quality. These two groups also differ in terms of the number of units of services they begin with and in terms of their knowledge about these products. Specifically, the sellers have owned their services for a sufficient

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[5] Akerlof, George A. (1970), "The Market for "Lemons": Quality, Uncertainty and the Market Mechanism," Quarterly Journal of Economics, 84: 488-500.

period of time to learn the quality of the unit they each own. It is this difference in ownership which drives the asymmetric information problem and this difference in and marginal valuations which defines the equilibrium.

The results of using a lemons market model for professional services illustrates that, without licensure, only nonprofessionals would buy professional services and the market may even fail to exist. In such a market, individual professionals would decide whether or not to sell their own services. The most intelligent, highest quality, professionals would not sell their services at all since they are worth more than they could be sold for. These high quality professionals would exit the market and choose alternate careers in which they are compensated for their quality. If any supply is provided, the price of professional services must exceed the average quality of professional services. With price exceeding average quality, only those whose marginal valuation for quality exceeds one would buy the service. Since the nonprofessionals have the higher marginal valuation in this model, the nonprofessionals buy and professionals do not. That is, nonprofessionals would buy unless average quality fell lower than their marginal valuation for quality, in which case the market fails to exist.

Although Akerlof's model illustrates the costs of asymmetric information, it is quite restrictive in the sense that his results depend on differing marginal valuations for quality. The natural extension of this model, therefore, is to eliminate this artificial restriction and, since demands depend on average quality, to ask what

happens to social welfare when we raise average quality--the subject of Leland's paper.

Leland's Models

Like Akerlof, Leland[6] allows the traded good's quality to vary over some interval. The range of the distribution is $[q_l', q_h']$ where q_l' is the lowest possible level of quality and q_h' is the highest possible level of quality. The density function is f(q) and the cumulative distribution function is F(q). The highest level of quality actually traded may be lower than q_h' and is denoted as q_h, while the lowest quality traded may exceed q_l' and is denoted q_l. We can raise either bound to raise average quality. Therefore, there are two social welfare models to consider: the social welfare lemons market and the social welfare licensure market.

The Social Welfare Problem in a Lemons Market

In the lemons market social welfare problem, we consider how choosing the highest level of quality affects social welfare. Evaluating social welfare in terms of consumer surplus, the problem is to maximize the area under the demand curve

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[6] Leland, Hayne (1979), "Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards," Journal of Political Economy, 87: 1328-1346.

choosing q_h, the highest level of quality actually traded. This problem can be written as

$$\underset{q_h}{\text{Max}}\ W = \underset{q_h}{\text{Max}} \int_0^y p(\bar{q},y')dy' - \int_{q_l'}^{q_h} R(q)f(q)dq \tag{2.1}$$

where demands are a function of average quality, $\bar{q}$, and quantity supplied, y, and R(q) is the cost of providing quality. The fact that the demands are a function of average quality rather than actual quality consumed is a feature of the asymmetric information problem. It is impossible for demands to relate to the actual quality consumed since that is an unknown parameter. Since this is a lemons market problem, the lower quality bound is fixed at q_l' and the choice variable is the highest level of quality.

With quality distributed uniformly, the supply of output is

$$y = \int_{q_l'}^{q_h} f(q)dq = F(q_h) - F(q_l') = F(q_h) \tag{2.2}$$

and average quality is

$$\bar{q} = \frac{1}{2}(q_h + q_l'). \tag{2.3}$$

The opportunity cost of providing quality, $R(q_h)$, is assumed to increase as quality increases, $dR/dq > 0$. The supply price is

$$p_s = R(q_h^e) \tag{2.4}$$

and is a price that supports q_h^e since potential suppliers will sell their services at price p_s if $q \leq q_h^e$, but will not if $q > q_h^e$. Demand is assumed to increase as average quality increases, and decrease as market supply increases.

$$p_D = p(\bar{q},y) \tag{2.5}$$

where

$$p_{\bar{q}} = \frac{dp}{d\bar{q}} > 0 \text{ and } p_y = \frac{dp}{dy} < 0$$

In equilibrium, supply price equals demand price, so,

$$R(q_h^e) = p\left(\frac{1}{2}(q_h^e+q_l'),F(q_h^e)\right) \tag{2.6}$$

Therefore, we can rewrite the lemons market social welfare problem (2.1) as

$$\underset{q_h}{\text{Max } W} = \underset{q_h}{\text{Max}} \int_0^{F(q_h)} p\left(\frac{1}{2}(q_h+q_l'),y'\right)dy' - \int_{q_l'}^{q_h} R(q)f(q)dq. \tag{2.7}$$

And, differentiating with respect to q_h shows us how consumer surplus changes with choice of the best quality. The first order condition for maximizing consumer surplus is

$$\frac{dW}{dq_h} = \frac{1}{2}\int_0^{F(q_h)} \frac{dp}{d\bar{q}}(\bar{q},y')dy' + \left[p(\bar{q},F(q_h)) - R(q_h)\right] f(q^h) = 0. \qquad (2.8)$$

Solving this yields the optimal q_h^*. This can be compared to the equilibrium q_h^e by determining dW/dq_h evaluated at q_h^e. Using (2.6), this equals

$$\frac{dW}{dq_h}\Big|_{q_h^e} = \frac{1}{2}\int_0^{F(q_h^e)} \frac{dp}{d\bar{q}}(\bar{q},y')dy' > 0 \qquad (2.9)$$

Since $d^2W/dq_h^2 < 0$, $q_h^e < q_h^*$. In other words, a lemons market underprovides quality relative to that which is socially optimal.

The Social Welfare Problem in a Licensed Market

To model occupational licensure from a social welfare perspective, Leland changes the social welfare problem to consider how choosing the lowest level of quality affects social welfare. Again, evaluating social welfare in terms of consumer

surplus, the problem is to maximize the area under the demand curve now choosing the lowest level of quality allowed in the market or

$$\underset{q_l}{\text{Max}}\ W = \underset{q_l}{\text{Max}} \int_0^y p(\bar{q},y')dy' - \int_{q_l}^{q_h} R(q)dq. \tag{2.10}$$

When we allow the lower bound to change, average quality changes to

$$\bar{q} = \frac{1}{2}(q_h + q_l) \tag{2.11}$$

and market supply changes to

$$y = \int_{q_l}^{q_h} f(q)dq = F(q_h) - F(q_l) \tag{2.12}$$

In equilibrium, demand price equals supply price, or

$$R(q_h^e) = p\left(\frac{1}{2}(q_h^e + q_l),\ F(q_h^e) - F(q_l)\right) \tag{2.13}$$

and we can rewrite the licensure social welfare problem as

$$\underset{q_l}{\text{Max}}\ W = \underset{q_l}{\text{Max}} \int_0^{F(q_h^e)-F(q_l)} p(\bar{q}^e,y')dy' - \int_{q_l}^{q_h^e} R(q)f(q)dq. \tag{2.14}$$

The optimal lowest quality, q_l^*, is found by setting the derivative of W with respect to q_l equal to zero.

$$\frac{dW}{dq_l} = \frac{d\bar{q}^e}{dq_l} \int_0^{F(q_h^e)-F(q_l)} p_{\bar{q}}(\bar{q}^e, y')dy' + p\left(\bar{q}^e,\ F(q_h^e)-F(q_l)\right)\left[f(q_h^e)\frac{dq_h^e}{dq_l} - f(q_l)\right]$$

$$- R(q_h^e)\, f(q_h^e)\frac{dq_h}{dq_l} + R(q_l)\, f(q_l) = 0$$

From (2.11),

$$\frac{d\bar{q}}{dq_l} = \frac{1}{2}\left(\frac{dq_h^e}{dq_l} + 1\right).$$

Substituting this and (2.13) in yields

$$\frac{dW}{dq_l} = \left(\frac{1}{2}\int_0^{F(q_h^e)-F(q_l)} p_{\bar{q}}(\overline{q^e}, y')dy'\right)\left(1 + \frac{dq_h}{dq_l}\right) + \left[R(q_l) - R(q_h^e)\right] f(q_l) = 0, \qquad (2.15)$$

Equation (2.15) assumes an interior solution. At the point where $q_l = q_l'$, if $dW/dq_l > 0$, then such an interior solution exists and it is optimal to set a lower limit on q_l above q_l'. However, examining (2.15), Leland finds that he can not make such a claim since the sign of dW/dq_l is ambiguous at the point where $q_l = q_l'$. Therefore, licensure is not necessarily justified based on Leland's model and whether or not it becomes justified depends on the demand and supply equations and their parameters. As an example, Leland solved for the case where the demand equation is linear, the supply equation is quadratic, and f(q) is uniform with $q_l' = 0$. Under these

circumstances, he showed that dW/dq_l at $q_l' = 0$ is positive so social welfare is increased by imposing a minimal quality standard.

The Rent Maximizing Licensure Model

Finally, Leland examines the effect on social welfare of having the professional group choose the lower limit of quality themselves. The professionals' problem is defined to be to maximize producers' surplus or total revenues minus opportunity costs:

$$\underset{q_l}{\text{Max}}\ \Pi = \underset{q_l}{\text{Max}}\ p(\bar{q}^e, y^e)y^e - \int_{q_l}^{q_h} R(q)\ f(q)dq \qquad (2.16)$$

Differentiating (2.16) with respect to q_l gives the optimal lower bound on quality from the profit maximizing professional's perspective.

$$\frac{d\pi}{dq_l} = p_{\bar{q}^e}\frac{d\bar{q}}{dq_l}y^e + p_{y^e}\frac{dy^e}{dq_l}y^e + p\frac{dy^e}{dq_l} - R(q_h^e)f(q_h^e)\frac{dq_h^e}{dq_l^e} + R(q_l)f(q_l) = 0$$

Rearranging this first order condition and substituting in from (2.11), (2.12), and (2.13) this reduces to

$$\left[F(q_h^e) - F(q_l)\right]\left[\frac{1}{2}P_{\bar{q}}^e\left(1 + \frac{\partial q_h^e}{\partial q_l}\right)\right] + p_{y^e}\left(f(q_h^e)\frac{\partial q_h^e}{\partial q_l} - f(q_l)\right)$$

$$+ \left[R(q_l) - R(q_h^e)\right] f(q_l) = 0 \qquad (2.17)$$

By comparing (2.15) and (2.17), Leland compares the social welfare and rent maximizing solutions. He shows that if

$$\left(\frac{1}{y^e}\right)\int_o^{y^e} p_{\bar{q}}(\overline{q^e}, y')dy' \leq p_{\bar{q}}(\overline{q^e}, y^e) \qquad (2.18)$$

and if R is a strictly convex function of q, then professionals will restrict entry too much and choose a level of q_l which exceeds the socially optimal level.[7] If condition (2.18) holds, the average of the marginal willingness to pay for quality over the range of consumption from 0 to y^e does not exceed the marginal willingness to pay for quality by the marginal consumer. Therefore, Leland's rent maximizing model of occupational licensure shows that professionals set quality above the social optimum--but only under certain conditions, that is only if equation (2.18) holds.

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[7] This is a sufficient but not necessary condition. Id. at 1338.

It is interesting to note that Spence looks at the monopolist's choice of quality and encounters this same condition.[8] The welfare condition in Spence's problem is

$$\frac{dW}{dq} = \int_0^x P_q(v,q)dv - xP_q(x,q) + \frac{\partial \pi(x,q)}{dq} \qquad (2.18')$$

where price is p, quantity is x, and product quality is q. Since $d\pi/dq = 0$ for a monopolist, Spence obtains the same condition as Leland: when the average valuation of quality exceeds the marginal valuation, $dW/dq > 0$, and the monopolistic firm sets quality too low.

These conditions (2.18) and (2.18') do not result from informational asymmetry problems and should not be interpreted as such. These simply result from first order conditions and show that the average valuation of quality (at the margin) is the relevant quality for welfare maximization, but monopolistic firms or professional groups respond to the marginal individual's valuation. (For firms to respond otherwise they would need to be able to price discriminate.) Differences between the average and marginal valuations only indicate we are away from the social optimum.

One criticism of Leland's model of licensed professions is that it misses one of licensure's key features. The typical criticism of and image of licensed professions is that they restrict entry to maximize the profits of the extant professions. It seems

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[8] Spence, A. M. (1975), "Monopoly, Quality, and Regulation," Bell Journal of Economics, 6: 417-29, at page 419.

that modelling the existing professionals' goal as maximizing the profits of both the old and new lawyers is to portray them as a more altruistic group than is justified. A more realistic model would portray the old lawyers' objectives as only to maximize their own profits.

In summary, Akerlof's lemons market model illustrates the social welfare cost of asymmetric information. Leland's extension of the lemons market model shows that a lemons market underprovides quality relative to what is socially optimal, but his licensure model does not necessarily show this. In Leland's social welfare licensure model, the sign of dW/dq_l is ambiguous, so we can not necessarily argue it is socially beneficial to license professions. Finally, the rent maximizing licensure model shows that professionals set quality above the social optimum--but only under certain conditions.

Given this background, my goal in this chapter is to re-examine the welfare implications of choosing the lower quality bound using four possible descriptions of licensing behavior. In addition to welfare and profit maximizing behavior, I consider the implications of maximizing quality and maintaining minimum quality standards. My model also differs from its predecessors since I distinguish between three different groups of professionals in a multiperiod setting. This additional dimension of complexity allows me to derive testable hypotheses.

A Vintage Occupational Licensure Model

The model contains four groups of actors: three groups of professionals and one group of consumers. I consider one type of professionals and call them lawyers. The three groups of lawyers are old lawyers, applicants, and entrants. The old lawyers passed the bar examination in previous periods. Applicants are the group of potential entrants who want to enter the market next period but must first be screened. Entrants are the subset of applicants who passed the bar examination this period and will be admitted to the bar in the next period.

In order to distinguish between the three groups of lawyers, I use subscripts of the letter o for old lawyers, subscripts of the number 1 for new lawyers, and applicants are distinguished from entrants with a hat. This notation is summarized below in Table 2.1.

Table 2.1
Notation

Group	Number	Quality of Worst Person in the Group	Quality of Best Person in the Group
Previous Old Applicants	$\hat{N}_o$	$\hat{a}_o$	b
Old Lawyers	N_o	a_o	b
Applicants	$\hat{N}_1$	$\hat{a}_1$	b
Entrants	N_1	a_1	b

As in Akerlof's and Leland's models, the quality of legal services varies along some interval. The upper bound of quality for each group is b, the lower quality bound is a, and the number of lawyers within each group is N. I assume that there is a cumulative distribution function of abilities, F(q), where F(a) = 0 and F(b) = 1 which is constant over time. In particular, the top of the distribution, F(b) is fixed and is a 100% score on the exam. The probability density function is f(q).

Examinations measure quality perfectly and provide a complete separation between candidates. The professions' problem is to find the minimum level of quality of the new group of entrants which meets its objectives. This minimum acceptable level of quality is a_i. The poorest quality applicants are those which are screened out and are those whose examination are below a_i. The cumulative distribution function is defined such that $F(a_i) \equiv Pr\ \{a < a_i\}$. Passing the exam requires $a \geq a_i$ so $Pr\{Pass\} = 1 - F(a_i)$ yielding

$$N_i(a_i) = [1 - F(a_i)]\ \hat{N}_i \tag{2.19}$$

The average quality of old lawyers is

$$\bar{q}_o = \frac{\int_{a_o}^{b} q\ f(q)dq}{\int_{a_o}^{b} f(q)dq} \tag{2.20}$$

and that of entrants is

$$\bar{q}_1 = \frac{\int_{a_1}^{b} q\ f(q)dq}{\int_{a_1}^{b} f(q)dq} \tag{2.21}$$

Due to the fundamental theorem of integral calculus and the fact that $F(b) = 1$, we know

$$\int_{a_1}^{b} f(q)dq = 1 - F(a_1)$$

so

$$\bar{q}_1 = \frac{\int a_1{}^{b}\ qf(q)dq}{1 - F(a_1)} \tag{2.21'}$$

and then integrating $\bar{q}_1$ by parts we have

$$\bar{q}_1 = \frac{q\ F(q)]_{a_1}^{b} - \int_{a_1}^{b} F(q)dq}{1 - F(a_1)} = \frac{b - a_1F(a_1)}{1-F(a_1)} - \frac{\int_{a_1}^{b} F(q)dq}{1-F(a_1)} \tag{2.21"}$$

Average quality next period is a weighted sum of $\bar{q}_o$ and $\bar{q}_1$

$$\bar{Q}(a_1) = \frac{\delta N_o \bar{q}_o + N_1(a_1)\bar{q}_1(a_1)}{\delta N_o + N_1(a_1)} = \bar{q}_1 + \frac{\delta N_o(\bar{q}_o - \bar{q}_1)}{\delta N_o + N_1(a_1)} \tag{2.22}$$

Demands are defined to be a function of average quality, $\bar{Q}$, and the price per hour of legal services, p_L and are represented as

$$H = G(\bar{Q}(a_1), p_L(a_1)) \tag{2.23}$$

with inverse demands represented as

$$P_L = F(H(a_1), \bar{Q}(a_1)) \tag{2.24}$$

These satisfy the standard demand assumptions that $G_{\bar{Q}} > 0$, $G_P < 0$, $F_H < 0$, and $F_{\bar{Q}} > 0$. The fact that demand is assumed to be a function of average quality rather than the actual quality consumed is again, like Leland's model, due to the fact that this is an asymmetric information problem. Consumers can not discern an individual attorney's quality so it is impossible for demands to relate to actual quality consumed. Consumers do know the attorneys' quality distribution and the number of attorneys so they can compute the quality mean. This assumption is strong in a sense if you believe that some law firms have better lawyers overall than other law firms and consumers know which are the better law firms. Instead, this assumption implies that all law firms have the same average quality of lawyers. Legal output differs across law firms only in that some law firms devote more time and resources in production. This creates a quantity difference across law firms, not an average quality difference.

In addition, the reason for establishing a two-period framework is to establish a clear dichotomy between the old lawyers and the new entrants. There are only old lawyers in the first period and these lawyers choose the quality of the worst entrant. Second period average quality is the average total quality of new and old lawyers while first period average quality is only the average quality of the old lawyers. Consumer demand is a function of second period average quality ($\bar{Q}_{t+1}$) not because the timing of information received is important. Instead, consumer demand is a function of $\bar{Q}_{t+1}$ because this is the average quality determined after the lawyers have selected the worst entrant and consequently the pass rate. Setting up the model so that demand is a function of first period average quality ($\bar{Q}_t$) would make demand a function of the average quality of the old lawyers only. Using $\bar{Q}_t$ omits consideration of the quality of the new lawyers and side-steps the main question of interest.

The supply of legal services in the first period is the number of old lawyers. The supply of legal services in the second period is the fraction of old lawyers remaining plus the number of entrants,

$$S_t = N_o \tag{2.25}$$

$$S_{t+1} = \delta N_o + N_1, \tag{2.26}$$

where δ is one minus the depreciation rate. Assume that the cost per hour of legal

services, c, is a constant and that supply is exogenously given so that it is vertical at $\delta N_o + N_1$. These supply assumptions differ from Leland's since he allowed marginal cost to vary with quality so that supply is increasing in price. In this model, however, supply is exogenously given since our purpose is to concentrate on the informational aspects of the occupational licensure problem.

Equilibrium is where demand equals supply,

$$H^e(\bar{Q}(a_1), p_L(a_1)) = \delta N_o + N_1(a_1), \tag{2.27}$$

and price is defined to be the price per hour of legal service, p_L, that solves (2.27). Differentiating the equilibrium condition, we have

$$\frac{dH^e}{da_1} = H^e_{\bar{Q}} \frac{d\bar{Q}(a_1)}{da_1} + H^e_{P_L} \frac{dP_L(a_1)}{da_1} = \frac{dN_1(a_1)}{da_1} < 0 \tag{2.28}$$

so the equilibrium number of attorneys falls as the quality of the worst entrant increases.

Differentiating next period's average quality (2.22) with respect to the choice of the lowest quality of entrant allowed in the market gives

$$\frac{d\bar{Q}}{da_1} = \frac{\left[\frac{dN_1}{da_1}\bar{q}_1 + \frac{d\bar{q}_1}{da_1}N_1\right][\delta N_0 + N_1] - \frac{dN_1}{da_1}(\delta N_0 \bar{q}_0 + N_1 \bar{q}_1)}{(\delta N_0 + N_1)^2}. \tag{2.29}$$

Rearranging this expression we have

$$\frac{d\bar{Q}}{da_1} = \frac{\frac{dN_1}{da_1}[\delta N_0(\bar{q}_1 - \bar{q}_0)] + \frac{d\bar{q}_1}{da_1} N_1[\delta N_0 + N_1]}{(\delta N_0 + N_1)^2}. \qquad (2.29')$$

The sign of this derivative depends on the relation between $\bar{q}_1$ and $\bar{q}_o$ and the relative magnitudes of the two numerator terms. Considering the first numerator term, the derivative dN_1/da_1 is strictly negative since the number of entrants always falls as we raise the quality of the worst entrant. Therefore, the first numerator term will be positive or negative depending on whether $\bar{q}_o$ is greater or less than $\bar{q}_1$ and hence on whether a_o is greater or less than a_1. The second numerator term is positive since $\bar{q}$ rises as you raise the worst entrant's quality ($d\bar{q}_1/da_1 > 0$). Therefore, there are three cases:

$$\text{if } \bar{q}_1 \leq \bar{q}_o, \text{ then } \frac{d\bar{Q}}{da_1} > 0, \qquad (i)$$

$$\text{if } \bar{q}_1 > \bar{q}_o \text{ and } \frac{dN_1}{da_1}[\delta N_o(\bar{q}_o - \bar{q}_1)] < \frac{d\bar{q}_1}{da_1} N_1(\delta N_o + N_1), \text{ then } \frac{d\bar{Q}}{da_1} > 0, \qquad (ii)$$

$$\text{if } \bar{q}_1 > \bar{q}_o \text{ and } \frac{dN_1}{da_1}[\delta N_o(\bar{q}_o - \bar{q}_1)] > \frac{d\bar{q}_1}{da_1}N_1(\delta N_o + N_1), \text{ then } \frac{d\bar{Q}}{da_1} < 0. \qquad \text{(iii)}$$

This means that if the average quality of the entrants is less than or equal to the average quality of the old lawyers (case i), overall average quality will always increase when the average quality of new lawyers is increased. However, if the average quality of the entrants is greater than the average quality of the old lawyers (cases ii and iii), overall average quality depends on how choosing a_1 affects the number of new lawyers and their average quality. For example, in case (iii), when there is a uniform distribution and a_1 is close to b, dN_1/da_1 [δN_o ($\bar{q}_o$ - $\bar{q}_1$)] is large while $d\bar{q}_1/da_1$ goes to zero. Raising a_1 lowers $\bar{Q}(a_1)$ since the effect of the reduction in the number admitted outweighs the effect of the increase in average quality of those admitted. Likewise, in case (ii), if a_1 is close to 0, raising a_1 raises $\bar{Q}(a_1)$ since the increased average quality effect outweighs the effect of decreasing the number admitted.

In addition, from (2.19) we know

$$\frac{dN_1}{da_1} = \frac{-dF(a_1)}{da_1}\hat{N}_1 = \frac{-d}{da_1}\int_0^{a_1} f(q)dq\ \hat{N}_1 = -f(a_1)\hat{N}_1 \qquad (2.30)$$

and from (2.21) we know[9]

$$\frac{d\bar{q}_1}{da_1} = \frac{f(a_1)\int_{a_1}^{b}(1-F(q))\,dq}{[1-F(a_1)]^2} = \frac{f(a_1)(\bar{q}_1-a_1)}{[1-F(a_1)]}. \tag{2.31}$$

Substituting the derivatives from (2.31) into (2.29') we have

$$\frac{d\bar{Q}}{da_1} = \frac{f(a_1)\,\hat{N}_1\,[\,(\bar{q}_1 - a_1)(\delta N_o + N_1) - \delta N_o(\bar{q}_1 - \bar{q}_o)\,]}{(\delta N_o + N_1)^2}$$

or

$$\frac{d\bar{Q}}{da_1} = \frac{f(a_1)\,\hat{N}_1\,[\,N_1(\bar{q}_1 - a_1) + \delta N_o(\bar{q}_o - a_1)\,]}{(\delta N_o + N_1)^2} \tag{2.32}$$

The sign of $d\bar{Q}/da_1$ is determined by the sign of $N_1(\bar{q}_1-a_1) + \delta N_o(\bar{q}_o - a_1)$. Since[10]

$$\frac{d\,[N_1(\bar{q}_1 - a_1) + \delta N_o(\bar{q}_o - a_1)]}{da_1} < 0 \tag{2.33}$$

$d\bar{Q}/da_1$ can have only one value of a_1 at which it equals zero. Hence, $\bar{Q}$ is a single peaked function of a_1.

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[9] For proof of (2.31), see Appendix A.

[10] For proof that (2.33) decreases in a_1, see Appendix A.

The profession's problem in choosing its new entrants is to choose the minimum level of quality acceptable in order to meet its objectives. There are four models which could easily describe the profession's objectives: social welfare maximization, rent maximization, quality maximization, and quality maintenance. Economists typically assume that professions follow rent maximization. However, the professions themselves argue one of the other three models best describe their behavior. The central goal of this thesis is to compare the results of these four possible models for choosing the pass rate of new professional entrants and to relate these pass rate results to the empirical evidence on pass rates found in the legal profession.

The Social Welfare Licensure Problem

The social welfare licensure problem[11] is to choose the quality of the worst entrant so to maximize the sum[12] of consumer and producer surplus, or

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[11] Equivalently, the inverse social welfare problem is

$$\underset{a_1}{\text{Max}}\ W = \underset{a_1}{\text{Max}} \int_{P_L}^{\infty} G(P_L', \bar{Q}(a_1))dP_L' + P_L H^e$$

and gives the first order condition

$$\frac{dW}{da_1} = \frac{d\bar{Q}}{da_1}\int_{P_L}^{\infty} G_{\bar{Q}}(P_L', \bar{Q}(a_1))dP_L' + F(H', \bar{Q}(a_1))\frac{dH^e}{da_1} = 0$$

[12] Note that due to the vertical supply, the producers' surplus equals the consumers' cost of legal services. This means that the costs cancel out exactly so they do not appear in the problem. The sum of consumer and producer surplus is simply the area under the demand curve.

$$\underset{a_1}{\text{Max}}\ W = \underset{a_1}{\text{Max}} \int_0^{H^e(a_1)} F(H',\bar{Q}(a_1))dH'. \tag{2.34}$$

Differentiating social welfare with respect to the quality of the worst entrant gives

$$\frac{dW}{da_1} = \frac{d\bar{Q}}{da_1}\int_0^{H^e} F_{\bar{Q}}(H',\bar{Q})\ dH' + F\left(H^e(a_1),\ \bar{Q}(a_1)\right)\frac{dH^e}{da_1} = 0. \tag{2.35}$$

From differentiating the equilibrium condition in (2.28), we know that $dH^e/da_1 < 0$ so the second term in (2.35) is negative. Since $F_{\bar{Q}} > 0$, $d\bar{Q}/da_1 > 0$ is a necessary condition for the social welfare problem's first order condition to hold. Then, since $d\bar{Q}/da_1 > 0$, either

$$\bar{q}_1 \leq \bar{q}_o, \tag{i}$$

$$\text{or}\ \ \bar{q}_1 > \bar{q}_o \text{ and } \frac{dN_1}{da_1}[\delta N_o(\bar{q}_o - \bar{q}_1)] < \frac{d\bar{q}_1}{da_1}N_1(\delta N_o + N_1). \tag{ii}$$

And since any relation between $\bar{q}_1$ and $\bar{q}_o$ is possible, then any relation between a_1 and a_o is possible. The pass rate may be higher or lower for new entrants than for old lawyers.

The first order condition in this model (2.35) is similar to that in Leland's model (2.15). Here, the first order condition equates the product of $d\bar{Q}/da_1$ and the

integral of the marginal valuation of quality (the marginal benefit of an increase in a_1) to the product of dN_1/da_1 and the price of legal services (the marginal cost in lost quantity of an increase in a_1.) In Leland's model, the same marginal benefit is equated to the difference between the price of legal services (determined by the opportunity cost of the best lawyer) and the opportunity cost of the worst lawyer. In this vintage model, however, opportunity costs do not arise since opportunity costs are independent of quality.

The Rent Maximizing Problem

In the rent maximizing problem, the old attorneys choose the worst entrant's quality in order to maximize their own income. This problem is written as

$$\underset{a_1}{\text{Max}}\ \Pi^{old} = \delta N_o P_L = \delta N_o F(H,\bar{Q}(a_1)) \tag{2.36}$$

and differentiating with respect to a_1 gives

$$\frac{d\Pi^{old}}{da_1} = \delta N_o \frac{dP_L(a_1)}{da_1} = \delta N_o \left[F_{H^e} \frac{dH^e(a_1)}{da_1} + F_{\bar{Q}} \frac{d\bar{Q}(a_1)}{da_1} \right] = 0. \tag{2.37}$$

Under the ordinary demand assumptions (demand for services increases with average quality ($F_{\bar{Q}} < 0$) and diminishes with increasing quantity ($F_H > 0$))the sign of $d\bar{Q}/da_1$ must be the same as dH^e/da_1. From (2.28), $dH^e/da_1 = dN_1/da_1 < 0$.

Hence, in sharp contrast to the social welfare problem, $d\bar{Q}/da_1 < 0$ is a necessary condition for the rent maximizing first order condition to hold. This in turn implies case (iii) above

$$\bar{q}_1 > \bar{q}_o \text{ and } \frac{dN_1}{da_1}[\delta N_o(\bar{q}_o - \bar{q}_1)] > \frac{d\bar{q}_1}{da_1}N_1(\delta N_o + N_1) \qquad \text{(iii)}$$

so $a_1 > a_o$.

To interpret the first order condition (2.37), remember that demand is simply a function of average quality and price (number of lawyers). Therefore, the first order condition says that in the rent maximizing equilibrium, the effect on demand from changing a_1 through average quality is the same (exact opposite) as the effect on demand from changing a_1 through price (quantity).

To further compare these first order conditions (2.35) and (2.37), remember that $P_L = F(H,Q)$, so $F_{\bar{Q}}$ is the inverse demand function's marginal quality curve and the first term in (2.35) is the area under this curve. And, since

$$F(H^e,\bar{Q}) = \int_0^{H^e} \frac{dF(H',\bar{Q})}{dH}dH' + F(0,\bar{Q})$$

we can rewrite the social welfare first order condition (2.35) as

$$\frac{d\bar{Q}}{da_1}\int_0^{H^e} F_{\bar{Q}}(H',\bar{Q}(a_1))dH' = -\frac{dN_1}{da_1}\left[\int_0^{H^e} F_H(H',\bar{Q}(a_1))dH' + F(0,\bar{Q}(a_1))\right] \qquad (2.35')$$

and re-arranging the rent maximizing first order condition (2.37) we have

$$\frac{d\bar{Q}}{da_1} F_{\bar{Q}}(H^e,\bar{Q}(a_1)) = -\frac{dN_1}{da_1}F_H(H^e,\bar{Q}(a_1)). \qquad (2.37')$$

Therefore, the rent maximization problem is set so that its effects on the marginal value of legal services defined by the equilibrium price via quality and quantity are equated. In the social welfare problem, the effects of the lower bound on inframarginal values defined by the area under the demand curve are significant.

Maximizing Next Period's Average Quality

The professions' problem could also be viewed as maximizing next period's average quality. If this is the case, then the first order condition from differentiating next period's average quality with respect to a_1 is (2.29). In order for this to hold, the two terms in the numerator of (2.29) must exactly cancel out. Since the second numerator term must be positive and $dN_1/da_1 < 0$, $\bar{q}_1$ must be greater than $\bar{q}_o$, so a_1 must be greater than a_o. The benefit from increasing a_1 by raising the average quality of entrants is equal to the loss from having fewer entrants who are more qualified than old lawyers.

Solving the first order condition gives the optimal value of average quality of entrants which is

$$\bar{q}_1 = \bar{q}_o - \frac{\frac{d\bar{q}_1}{da_1} N_1[\delta N_o + N_1]}{\frac{dN_1}{da_1}\delta N_o}. \tag{2.38}$$

Substituting in (2.19), (2.20), (2.21), (2.30), and (2.31) gives

$$a_1 = a_o + \frac{\int_{a_o}^{b}(1-F(q))\,dq}{1 - F(a_o)} - \frac{\int_{a_1}^{b}(1-F(q))dq}{1-F(a_1)} + (\bar{q}_1 - a_1)\left(1+\frac{N_1}{\delta N_o}\right)$$

Then using the value of $\bar{q}_1$ which had been integrated by parts in (2.21") we can solve for $\bar{q}_1 - a_1$

$$\bar{q}_1 - a_1 = \frac{b - a_1 + \int_{a_1}^{b} F(q)dq}{1 - F(a_1)} = \frac{\int_{a_1}^{b}(1-F(q))dq}{1-F(a_1)}$$

Substituting this into the previous value of a_1 and simplifying gives

$$a_1 = a_o + \frac{\int_{a_o}^{b}(1-F(q))dq}{1-F(a_o)} + \frac{N_1}{\delta N_o}\frac{\int_{a_1}^{b}(1-F(q))dq}{1-F(a_1)}$$

Finally, using the definitions $N_1 = (1\text{-}F(a_1))\hat{N}_1$ and $N_o = (1\text{-}F(a_o))\hat{N}_o$, a_1 may be represented as

$$a_1 = a_o + \frac{\int_{a_o}^{b}(1-F(q))dq + \frac{\hat{N}_1}{\delta\hat{N}_o}\int_{a_1}^{b}[1-F(q)]dq}{1-F(a_o)} \qquad (2.39)$$

From (2.39), given any specific function F(q), a specific value of a_1 can be determined.

Maintaining Average Quality

The final licensure problem to be considered is the problem of maintaining average quality at the level $\bar{q}_o$. If the professions maintain $\bar{q}_o$, they choose a_1 so that $\bar{q}_1 = \bar{q}_o$. This is equivalent to maintaining a minimum quality standard or requiring $a_1 = a_o$. Therefore, from case (iii), maintaining $\bar{q}_o$ implies $d\bar{Q}/da_1 > 0$.

The Average Quality Frontier

To compare the four possible licensure problems, we can map out an average quality frontier. From (2.32), we know the frontier is single peaked so we know it will typically assume a shape like that in Figure 2.1 on the following page.

Table 2.2

Comparison of the Four Total Quality Derivatives and Lower Bound Relation

Licensure Problem	Total Quality Derivative	Relation Between Lower Bounds
Maximizing Social Welfare	$d\bar{Q}/da_1 > 0$	$a_1 \leq a_o$ $a_1 \geq a_o$
Maintain $\bar{q}_o$	$d\bar{Q}/da_1 > 0$	$a_1 = a_o$
Maximizing $\bar{Q}$	$d\bar{Q}/da_1 = 0$	$a_1 > a_o$
Maximizing Rents	$d\bar{Q}/da_1 < 0$	$a_1 > a_o$

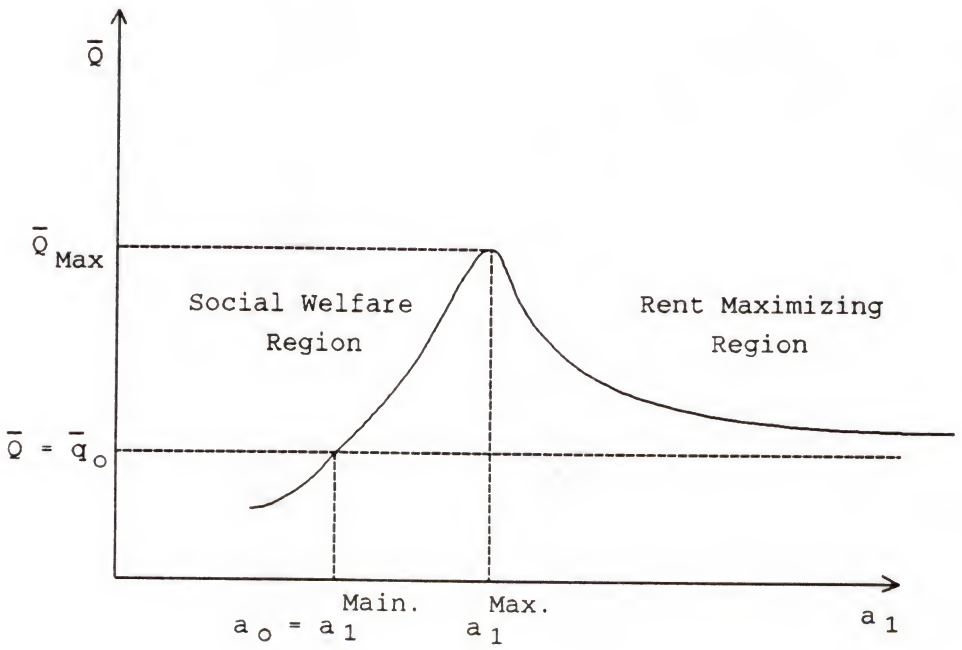

Figure 2.1
The Average Quality Frontier

What is most interesting about the average quality frontier is that the social welfare optimum occurs on its increasing side since $d\bar{Q}/da_1$ is positive in that problem. However, in contrast, the rent maximizing optimum appears on the opposite,decreasing side of the frontier since in that region $d\bar{Q}/da_1$ is negative. This and the fact that $\bar{Q}$ is single peaked means that the quality of the worst entrant in a rent maximization problem will always exceed that quality in a social welfare problem. This is a much stronger statement than Leland could make since he needed an additional condition (2.18) for $a_1^{RS} > a_1^{SW}$. It is not necessarily true, however, that the average quality of all lawyers will be higher in a rent maximization problem. The relationship between the average qualities for these problems depends on where the professions locate on the frontier.

We can also reach conclusions about how the pass rate changes over time in the four models due to the results on the lower bound relations. Under social welfare maximization the pass rate $(1\text{-}F(a_1))$ can either decline or rise over time since either $a_1 \geq a_o$ or $a_1 \leq a_o$. Under rent maximization or quality maximization the pass rate will always decline over time since $a_1 > a_o$. Finally, under quality maintenance, the pass rate remains constant since $a_1 = a_o$. Since the pass rate is observable, these are testable implications of the models.

Comparative Statics

To develop the comparative static relationships, we assume a specific linear demand function.

$$H = \alpha + \beta\bar{Q} - \gamma P_L, \tag{2.40}$$

or

$$F = \frac{\alpha}{\gamma} + \frac{\beta}{\gamma}\bar{Q} - \frac{1}{\gamma}H^e$$

It is important to note that assuming a linear demand does not really limit the usefulness of the model. As we shall see, the strongest comparative static property results from the α parameter. If $H = \alpha + \hat{H}(\bar{Q},P_L)$, the comparative statics of a shift in α would be the same as under linearity. Since α is just the intercept, it causes a parallel shift in demand whether or not it is linear. For other parameters, assuming other demand functions would complicate matters and could change the comparative static results. Such complications are saved for future research.

The total average quality next period, $\bar{Q}(a_1)$, was previously defined in (2.22). Using the second form of $\bar{Q}$, the derivative of $\bar{Q}$ with respect to a_1 is

$$\frac{d\bar{Q}_1}{da_1} = \frac{d\bar{q}_1}{da_1} - \frac{\delta N_o}{H^e}\frac{d\bar{q}_1}{da_1} - \frac{\delta N_o(\bar{q}_o - \bar{q}_1)}{H^{e^2}}\frac{dH^e}{da_1} \tag{2.41}$$

which can be rearranged as

$$\frac{d\bar{Q}_1}{da_1} = \frac{N_1}{H^e}\frac{d\bar{q}_1}{da_1} - \frac{\delta N_o(\bar{q}_o - \bar{q}_1)}{H^{e^2}}\frac{dN_1}{da_1} \tag{2.41'}$$

It is this form of the average quality derivative which is used in the subsequent comparative static derivations.

Social Welfare

The social welfare problem is

$$\underset{a_1}{\text{Max}}\ W = \underset{a_1}{\text{Max}} \int_0^{H^e} \left[\frac{\alpha}{\gamma} + \frac{\beta}{\gamma}\bar{Q} - \frac{1}{\gamma}H'\right] dH' \tag{2.42}$$

and if a_1 is at an interior solution ($\hat{a}_1 < a_1 < b$), then

$$\frac{dW}{da_1} = \frac{d\bar{Q}}{da_1}\int_0^{H^e(a_1)} \frac{\beta}{\gamma}\, dH' + \frac{dH^e}{da_1}\left(\frac{\alpha}{\gamma} + \frac{\beta}{\gamma}\bar{Q} - \frac{1}{\gamma}H^e\right) = 0$$

Note that γ enters into the objective function as a multiplicative constant so it can have no effect on the choice of a_1. The first order condition reduces to

$$\frac{d\bar{Q}}{da_1}\beta H^e + \frac{dN_1}{da_1}(\alpha + \beta\bar{Q} - H^e) = 0. \tag{2.43}$$

and substituting for $\bar{Q}$ and $d\bar{Q}/da_1$ from (2.22') and (2.41')

$$\beta N_1\frac{d\bar{q}_1}{da_1} - \frac{\beta\delta N_o(\bar{q}_o-\bar{q}_1)}{H^e}\frac{dN_1}{da_1} + \frac{dN_1}{da_1}\left[\alpha+\beta\left(\bar{q}_1 + \frac{\delta N_o(\bar{q}_o-\bar{q}_1)}{H^e}\right)-H^e\right] = 0 \tag{2.44}$$

Combining terms gives

$$\beta\left(\bar{q}_1\frac{dN_1}{da_1} + N_1\frac{d\bar{q}_1}{da_1}\right) - (H^e - \alpha)\frac{dN_1}{da_1} = 0 \tag{2.45}$$

From the definition of N_1 in (2.19) and from the definition of $\bar{q}_1$ in (2.21') we can define

$$N_1\bar{q}_1 = \hat{N}_1\int_{a_1}^{b} q\ f(q)dq \tag{2.46}$$

so

$$\frac{dN_1\bar{q}_1}{da_1} = - \hat{N}_1 a_1 f(a_1) \tag{2.47}$$

Substituting (2.47) and (2.30) into the first order condition (2.45) yields

$$H^e - \alpha - \beta a_1 = 0$$

Then substituting in the definition of H^e (2.27)

$$\delta N_o + N_1(a_1) - \alpha - \beta a_1 = 0 \tag{2.48}$$

and substituting in the definition of the pass rate (2.19) gives

$$\delta \hat{N}_o(1-F(a_o)) + \hat{N}_1(1-F(a_1)) - \alpha - \beta a_1 = 0 \tag{2.48'}$$

The interior solution in (2.48') is valid only when $\hat{a}_1 < a_1 < b$. When $\delta \hat{N}_o(1-F(a_o)) + \hat{N}_1(1-F(a_1)) < \alpha$, then $a_1 = \hat{a}_1$ while when $\delta \hat{N}_o(1-F(a_o)) + \hat{N}_1(1-F(a_1)) > \alpha + \beta$, then $a_1 = b$.

The comparative statics can only be determined directly from (2.48') if an explicit distribution, like, for example, the uniform distribution is assumed. In the

case of the uniform distribution $1 - F(a_o) = 1 - a_o$ and $1 - F(a_1) = 1 - a_1$, so

$$a_1 = \frac{\delta \hat{N}_o(1-a_o) - \alpha + \hat{N}_1}{\beta + \hat{N}_1} \qquad (2.48'')$$

The general comparative static results are obtained by totally differentiating (2.48') with respect to the various parameters. Totally differentiating the first order condition $\delta W(a_1,P)/\delta a_1 = 0$ in (2.48) or (2.48') and letting P represent each of the possible parameters, gives

$$\frac{\delta^2 W}{\delta a_1^2}\frac{da_1}{dP} + \frac{\delta^2 W}{\delta a_1 dP} = 0$$

which is solved for da_1/dP in the equations below. $\delta^2 W/\delta a_1^2$ is abbreviated as Γ and $\Gamma < 0$ by the second order conditions.

$$\frac{da_1}{d\alpha} = \frac{1}{\Gamma} < 0$$

$$\frac{da_1}{d\beta} = \frac{a_1}{\Gamma} < 0$$

$$\frac{da_1}{d\delta} = \frac{-N_o}{\Gamma} > 0$$

$$\frac{da_1}{d\hat{N}_1} = \frac{-[1 - F(a_1)]}{\Gamma} > 0$$

$$\frac{da_1}{d\hat{N}_o} = \frac{-\delta [1 - F(a_o)]}{\Gamma} > 0$$

$$\frac{da_1}{da_o} = \frac{\frac{dF(a_o)}{da_o}\delta\hat{N}_o}{\Gamma} = \frac{f(a_o)\delta\hat{N}_o}{\Gamma} < 0$$

a_1 is decreasing in α, β and a_o and is increasing in δ, $\hat{N}_1$ and $\hat{N}_o$. It is independent of γ.

Rent Seeking

Substituting the linear demand, the first order condition (2.37) becomes

$$-\frac{dH^e(a_1)}{da_1} + \beta\frac{d\bar{Q}(a_1)}{da_1} = 0$$

Substituting (2.28) and (2.29') this becomes

$$-\frac{dN_1}{da_1} + \beta\frac{N_1}{H^e}\frac{d\bar{q}_1}{da_1} - \beta\frac{\delta N_o(\bar{q}_o - \bar{q}_1)}{H^{e2}}\frac{dN_1}{da_1} = 0$$

Because of (2.30) and (2.31), this can be rewritten as

$$\hat{N}_1 F(a_1) + \frac{\beta N_1}{H^e} \frac{f(a_1)(\bar{q}_1 - a_1)}{1 - F(a_1)} + \frac{\beta \delta N_o (\bar{q}_o - \bar{q}_1)}{H^{e2}} \hat{N}_1 F(a_1) = 0$$

Substituting $N_1 = (1 - F(a_1)) \hat{N}_1$ and cross multiplying by $H^{e2} / \hat{N}_1 f(a_1)$ gives

$$H^{e^2} + \beta H^e (\bar{q}_1 - a_1) + \beta \delta N_o (\bar{q}_o - \bar{q}_1) = 0$$

Substituting in H^e (2.27) produces

$$(\delta N_o + N_1)^2 + \beta (\delta N_o + N_1)(\bar{q}_1 - a_1) + \beta \delta N_o (\bar{q}_o - \bar{q}_1) = 0 \qquad (2.49)$$

and substituting in the definition of the pass rate (2.19) gives

$$[\delta \hat{N}_o (1 - F(a_o))] + \hat{N}_1 (1 - F(a_1))^2 + \beta [\, \delta \hat{N}_o (1 - F(a_o)) + \hat{N}_1 (1 - F(a_o)) \,] (\bar{q}_1 - a_1) + \beta \delta \hat{N}_o (1 - F(a_o)(\bar{q}_o - \bar{q}_1) = 0 \qquad (2.49')$$

Again, the comparative statics can only be directly obtained from (2.49') if an explicit distribution is assumed. The general comparative statics are obtained by totally differentiating (2.49') with respect to the various parameters, or

$$\frac{d^2\pi}{da_1^2} \frac{da_1}{dP} + \frac{d^2\pi}{da_1 dP} = 0,$$

which is solved for da_1/dP in the equations below. $d^2\pi/da^2$ is abbreviated as λ and $\lambda < 0$ by the second order conditions. Note also that in rent maximization $a_1 > a_o$, so $\bar{q}_o < \bar{q}_1$. α and γ do not enter the first order conditions so changes in these parameters have no effect on a_1. For the other parameters, the comparative statics are

$$\frac{da_1}{d\beta} = -\frac{1}{\lambda}\left[H^e(\bar{q}_1 - a_1) + \delta N_o(\bar{q}_o - \bar{q}_1)\right]$$
$$= -\frac{1}{\lambda}\left[(\delta N_o + N_1)(\bar{q}_1 - a_1) + \delta N_o(\bar{q}_o - \bar{q}_1)\right]$$

and due to (2.49)

$$\frac{da_1}{d\beta} = \frac{1}{\lambda}\frac{H^{e^2}}{\beta} < 0$$

$$\frac{da_1}{d\delta} = \frac{-N_o}{\lambda}\left[2H^e + \beta(\bar{q}_1 - a_1) + \beta(\bar{q}_o - \bar{q}_1)\right]$$
$$= \frac{-N_o}{\lambda}\left[2H^e + \beta(\bar{q}_o - a_1)\right] \lesseqgtr 0$$

$$\frac{da_1}{d\hat{N}_1} = \frac{-[1 - F(a_1)]}{\lambda}\left(2H^e + \beta(\bar{q}_1 - a_1)\right) > 0$$

$$\frac{da_1}{d\hat{N}_o} = \frac{-\delta[1 - F(a_o)]}{\lambda}\left(2H^e + \beta(\bar{q}_o - a_1)\right) \lesseqgtr 0$$

$$\frac{da_1}{da_o} = \frac{-\delta\hat{N}_o}{\lambda}\left[2H^e\delta\hat{N}_o\frac{-dF(a_o)}{da_o} + \beta\delta\hat{N}_o\frac{-dF(a_o)}{da_o}(\bar{q}_1 - a_1)\right]$$
$$- \frac{\delta\hat{N}_o}{\lambda}\left[\beta\delta\hat{N}_o\frac{-dF(a_o)}{da_o}(\bar{q}_o - \bar{q}_1) + \beta\delta\hat{N}_o(1-F(a_o))\frac{d\bar{q}_o}{da_o}\right]$$

$$\frac{da_1}{da_o} = \frac{\delta\hat{N}_o f(a_o)}{\lambda}\left[2H^e + \beta(\bar{q}_1 - a_1) + \beta(\bar{q}_o - \bar{q}_1) + \beta\frac{d\bar{q}_o}{da_o}\right]$$
$$= \frac{\delta\hat{N}_o f(a_o)}{\lambda}\left[2H^e + \beta\left(\bar{q}_o - a_1 + \frac{d\bar{q}_o}{da_o}\right)\right] \leq \text{ or } \geq 0$$

Therefore, a_1 decreases in β, increases in $\hat{N}_1$, and can have any sign with respect to changes in δ, $\hat{N}_o$, and a_o.

Quality Maximization

Under quality maximization, the first order condition is $d\bar{Q}/da_1 = 0$. Re-writing this first order condition (2.29) we have

$$\frac{d(N_1\bar{q}_1)}{da_1}\frac{1}{H^e} - \frac{\bar{Q}}{H^e}\frac{dH^e}{da_1} = 0$$

and substituting in (2.47) and (2.30) this becomes

$$-a_1 f(a_1)\hat{N}_1 + \bar{Q} f(a_1)\hat{N}_1 = 0$$

which simplifies to $\bar{Q} = a_1$. Therefore, under quality maximization, the pass rate is set so that the minimum quality of entrants equals the overall average quality. Therefore the comparative statics are simply the derivatives of $\bar{Q}$ with respect to the parameters. $\bar{Q}$ does not depend on demand so changes in α, β, and γ have no effect on a_1. Like rent maximization, in quality maximization $a_1 > a_o$, so $\bar{q}_1 > \bar{q}_o > a_o$. From (2.22) and (2.19)

$$a_1 = \bar{Q} = \bar{q}_1 + \frac{\delta N_o(\bar{q}_o - \bar{q}_1)}{\delta N_o + N_1(a_1)} = \bar{q}_1 + \frac{\delta \hat{N}_o[1-F(a_o)](\bar{q}_o - \bar{q}_1)}{\delta \hat{N}_o[1-F(a_o)] + \hat{N}_1[1-F(a_1)]}$$

$$\frac{da_1}{d\delta} = \frac{N_o N_1(\bar{q}_o - \bar{q}_1)}{H^{e2}} < 0$$

$$\frac{da_1}{d\hat{N}_1} = \frac{-\delta N_o(\bar{q}_o - \bar{q}_1)}{H^{e2}} > 0$$

$$\frac{da_1}{d\hat{N}_o} = \frac{\delta N_1(\bar{q}_o - \bar{q}_1)}{H^{e2}} < 0$$

For da_1/da_o, using the definition of $\bar{q}_o$ from (2.20), we can derive and use

$$\frac{d\bar{q}_o}{da_o} = \frac{-a_o f(a_o)}{1-F(a_o)} + \frac{\int_{a_o}^{b} qf(q)dq}{(1-F(a_o))^2} f(a_o)$$

$$= \frac{-a_o f(a_o)}{1-F(a_o)} + \frac{\bar{q}_o f(a_o)}{1-F(a_o)} = \frac{(\bar{q}_o - a_o)f(a_o)}{1-F(a_o)}$$

$$\frac{da_1}{da_o} = \frac{\delta\hat{N}_o(-f(a_o))(\bar{q}_o-\bar{q}_1) + \delta\hat{N}_o(1-F(a_o))\frac{d\bar{q}_o}{da_o}}{H^e} - \frac{\delta\hat{N}_o(1-F(a_o)(\bar{q}_o-\bar{q}_1)(-f(a_o))\delta\hat{N}_o}{H^{e^2}}$$

$$\frac{da_1}{da_o} = \frac{\delta\hat{N}_o}{H^{e^2}}\left[-f(a_o)(\bar{q}_o-\bar{q}_1)\,H^e + (1-F(a_o))\,H^e\left(\frac{(\bar{q}_o-a_o)f(a_o)}{1-F(a_o)}\right)\right]$$

$$+ \frac{\delta\hat{N}_o}{H^{e^2}}\left[(1-F(a_o)(\bar{q}_o-\bar{q}_1)\, f(a_o)\delta\hat{N}_o \right]$$

$$\frac{da_1}{da_o} = \frac{\delta\hat{N}_o}{H^{e^2}} f(a_o)\left[H^e(\bar{q}_1 - \bar{q}_o + \bar{q}_o - a_o) + \delta\hat{N}_o\,(1-F(a_o))\,(\bar{q}_o-\bar{q}_1)\right]$$

$$= \frac{\delta\hat{N}_o f(a_o)}{H^{e^2}}\left[(\delta N_o+N_1)\,(\bar{q}_1-a_o) + \delta N_o(\bar{q}_o-\bar{q}_1)\right]$$

$$= \frac{\delta\hat{N}_o\, f(a_o)}{H^{e^2}}\left[\delta N_o(\bar{q}_o-a_o) + N_1(\bar{q}_1-a_o)\right] > 0$$

So under quality maximization, a_1 decreases in δ and $\hat{N}_o$ while it increases in $\hat{N}_1$ and a_o.

Quality Maintenance

Finally, the quality maintenance problem leaves us with the simplest comparative static relationship of all. In this problem, the rule is to set

$$a_1 = a_o, \tag{2.48}$$

so a_1 increases in a_o but has no relationship to any other parameters in the quality maintenance problem.

Comparative Statics Summary

Therefore, in summary, the four possible models of occupational licensure behavior yield distinctly different comparative statics. These are summarized in Table 2.3 for ease of comparison.

From these comparative statics, we can see that under certain simplifying conditions the vintage occupational licensure is a very simple model which yields striking comparative static results. One of the most interesting results from this comparative statics exercise is that in a social welfare model, as the demand shift parameter (α) increases, marginal quality (a_1) falls, the number of entrants rises, and the percentage passing rises ceteris paribus. In contrast, there is no such direct relationship between increases in demand for professional services and the percentage passing in rent seeking, quality maximizing, or quality maintaining models.

Table 2.3
Comparative Statics Summary for Changes in a_1
with Respect to Changes in the Parameters

	α	β	γ	δ	$\hat{N}_1$	$\hat{N}_o$	a_o
Social Welfare	-	-	0	+	+	+	-
Rent Seeking	0	-	0	+-	+	+-	+-
Maximizing $\bar{Q}$	0	0	0	-	+	-	+
Maintaining $\bar{Q}$	0	0	0	0	0	0	+

DEFINITIONS: a_1 is worst entrant's quality. α is the demand intercept. β is the quality parameter. γ is the price parameter. δ is one minus the depreciation rate. $\hat{N}_i$ is the number of applicants. N_1 is the number of new entrants. a_o is the worst old lawyer's quality.

The signs which appear in this table are the signs of the derivative of a_1 with respect to each of the possible parameters. Therefore, the derivative of a_1 with respect to α in the rent seeking model is 0 whereas it is negative in the social welfare problem.

Therefore, if there is a persistent increase in the demand for legal services over a given period of time, the social welfare model predicts that the pass rate would rise over that same period, ceteris paribus.

There are two other parameters which have testable implications. The second testable comparative static result relates to changes in the number of applicants ($\hat{N}_1$). If the marginal quality level is independent of the number of applicants, ceteris paribus, we have evidence to support a maintaining average quality model over any of the other three models since $da_1/d\hat{N}_1 = 0$ under maintaining quality while it is positive otherwise. The third testable parameter is the depreciation rate. If fewer attorneys retire, δ rises. So if when the percentage of lawyers who are 65 years or older increases, the pass rate also falls, we have support for either the social welfare or rent seeking model. If the pass rate rises, this supports either the rent seeking or the maximizing quality model, and if there is no change in the pass rate, this supports the maintaining quality model.

Changes in the marginal demand for quality and the quality of the worst old lawyer also provide theoretically interesting results. It is possible that the demand for quality of lawyers (β) is related to the size of sectors of the economy which contribute most to the overall economy. Since the industrial and financial sectors are important to the health of the overall economy, these sectors have great stakes in the quality of legal services consumed and may have greater demand for higher quality services. This possibility was not considered until this dissertation was nearly completed, however, so these measures of β were saved for future research. When tested, the

beta derivatives could theoretically be used to distinguish the rent seeking and social welfare models from either of the average quality models. The derivative $da_1/d\beta$ is negative in the social welfare model and rent seeking models but is zero for both of the average quality models. Therefore, if as the marginal demand for quality rises the pass rate falls, ceteris paribus, we have support for either the social welfare or rent seeking models. If the pass rate does not change, we have empirical support for either of the average quality models. Similarly, if we could measure the actual quality of the worst old lawyer, the results from da_1/da_o could be used to further distinguish between the four models. A negative sign for da_1/da_o is possible in either the rent seeking or social welfare models. A positive sign for da_1/da_o is possible in rent seeking, maximizing, or maintaining quality. So if the pass rate rises in response to a change in a_o, it supports the social welfare model, a rising or falling pass rate can support the rent seeking model, while a falling pass rate supports either of the two average quality models.

In summary, the implication of these comparative static differences is that they allow us to empirically test between these four possible models of licensing behavior and may even, in contrast to most economics literature, support the argument that lawyers behave to maximize social welfare. These comparative statics results suggest clear empirical tests and provide the motivation for the empirical work which follows in the next chapter.

Extensions of the Vintage Occupational Licensure Model

In the present version of the vintage occupational licensure model, the demand functions (2.23) were limited to be a function of $\bar{Q}$ and p_L. The information structure is that consumers are unable to discern an individual professional's quality at all. Consumers know only the overall quality distribution and the numbers of professionals within each group so are only able to calculate average qualities. In large part, this gives rise to the most striking result that, in the rent maximization model, over time the average quality always rises and hence the pass rate always declines. As we shall see in the next chapter, this clearly seems to be contradicted by observation of the pass rate's time trends.

To see if this result is robust to changes in the assumptions, some modifications are considered. If the consumers were able to distinguish between lawyers in some dimension, they could use this additional knowledge to inform their consumption choices. In the market for licensed professions, the information problem clearly is the consumers' inability to discern an individual professional's quality. But, consumers can typically infer an individual's age or observe the date of his or her degree. One possible extension, therefore, would be to allow the consumers to observe the lawyers' ages. This would give consumers the ability to distinguish between the old lawyers and the new entrants and to develop demands for each. Consumers would use the group average qualities ($\bar{q}_o$ and $\bar{q}_1$) instead of the overall average quality ($\bar{Q}_{t+1}$) in their new demand functions.

First, assume a completely general set of demands in which old and new lawyers can be distinguished. Inverse demands would become

$$p_L^o = F_o\ (N_o,\ N_1,\ \bar{q}_1,\ \bar{q}_o) \tag{2.50}$$

$$p_L^1 = F_1\ (N_o,\ N_1,\ \bar{q}_1,\ \bar{q}_o) \tag{2.51}$$

and ordinary demand functions would become

$$\delta N_o = G_o\ (\bar{q}_1,\ \bar{q}_o,\ p_L^o,\ p_L^1)$$

$$N_1 = G_1\ (\bar{q}_1,\ \bar{q}_o,\ p_L^1,\ p_L^o)$$

Making the standard demand assumptions, we would expect that

$$\frac{dp_L^i}{d\bar{q}_i} > 0,\quad \frac{dp_L^i}{dN_i} < 0,\quad \frac{dp_L^i}{d\bar{q}_j} < 0,\quad \frac{dp_L^j}{dN_j} < 0$$

Therefore

$$\frac{dp_L^o}{da_1} = \frac{dp_L^o}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1} + \frac{dp_L^o}{dN_1}\frac{dN_1}{da_1}$$

so as a_1 is raised, $\bar{q}_1$ increases which lowers $p_L{}^o$, and as a_1 is raised N_1 also lowers which lowers $p_L{}^o$. So the effect of changing a_1 on $p_L{}^o$ is ambiguous. The important

point is that in the general case, old lawyers maximize p_L^o. Since dp_L^o/da_1 is ambiguous, an interior solution can exist. The old lawyers will set a_1 so that dp_L^o/da_1 equals 0. At this interior solution, it is unclear whether a_1 is greater or less than a_o. This will clearly depend on the relative magnitudes of the quantity and the quality effects on demand. If the quality effect dominates, then $a_1 < a_o$ and the number of lawyers will rise over time in the rent seeking model.

For further insight, assume a special case of the above general demand structure. Assume that individuals evaluate lawyers as a bundle which depends on the price and quality. Let $M^i (p_L^i), \bar{q}_i(a_i))$, where $\delta M^i/\delta p_L^i < 0$ and $dM^i/d\bar{q}_L > 0$, be the "value" of a vintage i lawyer. The demands now become

$$\delta N_o(a_o) = D^o \left(M^o\left(p_L^o, \bar{q}_o(a_o)\right), \quad M^1\left(p_L^1, \bar{q}_1(a_1)\right) \right) \tag{2.52}$$

$$N_1(a_1) = D^1 \left(M^o(p_L^o, \bar{q}_o(a_o)), \quad M^1(p_L^1, \bar{q}_1(a_1)) \right) \tag{2.53}$$

where

$$\frac{dD^i}{dM^i} > 0, \quad \frac{dD^i}{dM^j} < 0$$

This formulation embeds separability into the demand functions in evaluating different types of lawyers.

Totally differentiating (2.52) and (2.53) with respect to a_1 yields

$$\frac{dD^{\circ}}{dM^{\circ}}\frac{dM^{\circ}}{dp_L^{\circ}}\frac{dp_L^{\circ}}{da_1} + \frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}}\frac{dp_L^{1}}{da_1} + \frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1} = 0$$

$$\frac{dD^{1}}{dM^{\circ}}\frac{dM^{\circ}}{dp_L^{\circ}}\frac{dp_L^{\circ}}{da_1} + \frac{dD^{1}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}}\frac{dp_L^{1}}{da_1} + \frac{dD^{1}}{dM^{1}}\frac{dM^{1}}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1} = \frac{dN_1}{da_1}$$

Writing this in matrix form yields

$$\begin{bmatrix} \frac{dD^{\circ}}{dM^{\circ}}\frac{dM^{\circ}}{dp_L^{\circ}} & \frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}} \\ \frac{dD^{1}}{dM^{\circ}}\frac{dM^{\circ}}{dp_L^{\circ}} & \frac{dD^{1}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}} \end{bmatrix} \begin{bmatrix} \frac{dp_L^{\circ}}{da_1} \\ \frac{dp_L^{1}}{da_1} \end{bmatrix} = \begin{bmatrix} -\frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1} \\ -\frac{dD^{1}}{dM^{1}}\frac{dM^{1}}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1} + \frac{dN_1}{da_1} \end{bmatrix}$$

Using Cramer's rule:

$$\frac{dp_L^{\circ}}{da_1} = \frac{\left(-\frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1}\right)\frac{dD^{1}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}} + \left(\frac{dD^{1}}{dM^{1}}\frac{dM^{1}}{d\bar{q}_1}\frac{d\bar{q}_1}{da_1} + \frac{dN_1}{da_1}\right)\frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}}}{\left[\frac{dD^{\circ}}{dM^{\circ}}\frac{dD^{1}}{dM^{1}} - \frac{dD^{1}}{dM^{\circ}}\frac{dD^{\circ}}{dM^{1}}\right]\frac{dM^{1}}{dp_L^{1}}\frac{dM^{\circ}}{dp_L^{\circ}}}$$

$$\frac{dp_L^{\circ}}{da_1} = \frac{-\frac{dN_1}{da_1}\frac{dD^{\circ}}{dM^{1}}\frac{dM^{1}}{dp_L^{1}}}{\left[\frac{dD^{\circ}}{dM^{\circ}}\frac{dD^{1}}{dM^{1}} - \frac{dD^{1}}{dM^{\circ}}\frac{dD^{\circ}}{dM^{1}}\right]\frac{dM^{1}}{dp_L^{1}}\frac{dM^{\circ}}{dp_L^{\circ}}} \qquad (2.54)$$

If $dD^i/dM^j < 0$ and $dD^i/dM^i > 0$ and if the own effects dominate the cross

effects, then the denominator is positive. The numerator is also positive. Hence P_L^o is maximized when a_1 is at its maximum value.

As a special case, assume that clients choose a lawyer by looking for whoever offers the best set of attributes. Demands are

$$D^o(M^o, M^1) = 0 \text{ if } M^o < M^1$$

$$D^1(M^o, M^1) = 0 \text{ if } M^1 < M^o$$

so in equilibrium $M^o = M^1$ must hold if there is to be a positive demand for both vintages. That is, $M^o(p_L^o, \bar{q}_o(a_o)) = M^1(p_L^1, \bar{q}_1(a_1))$. Since both vintages of lawyers provide the same total value, customers are indifferent to which type they have. Let M denote the common value provided by the two types. Then, total demand for both types is a function of this value, M*, where D(M*) is the demand function. Market equilibrium requires that $D(M^*) = \delta N_o + N_1$. Given any a_1, there will be a unique value of M* which clears the market where

$$D'(M*)\frac{dM*}{da_1} = \frac{dN_1}{da_1}$$

or

$$\frac{dM*}{da_1} = \frac{dN_1/da_1}{d'(M*)} < 0.$$

The equilibrium value of p_L^o is determined by the equation $M^o(p_L^o, \bar{q}_o) = M^*$.

Differentiating this with respect to a_1 yields

$$\frac{dM^{\circ}}{dP_L^{\circ}} \frac{dp_L^{\circ}}{da_1} = \frac{dM^{*}}{da_1}$$

or

$$\frac{dp_L^{\circ}}{da_1} = \frac{dM^{*}/da_1}{dM^{\circ}/dp_L^{\circ}} > 0$$

Hence, a rise in a_1 always raises $p_L{}^{\circ}$. Old lawyers always benefit by raising the average quality of new lawyers. The rise in a_1 induces a sufficiently large rise in $p_L{}^1$ to reduce M^1. This allows $p_L{}^{\circ}$ to increase. Although in general having consumers observe the age of lawyers may mitigate the effect of rent seeking behavior to lead to a drop in the pass rate, for reasonable special cases it can actually strengthen that tendency. Thus, the prediction from the rent seeking model that a_1 will rise over time is not due solely to the assumption that individuals view all lawyers as identical.

Conclusions

The vintage occupational licensure model is a simple model which provides insights into the tradeoffs of quality and quantity which were not obvious with either Akerlof's or Leland's lemons market approaches. The model produces five general results which hold for any distribution of quality:

(1) A rent maximizer equates how changing the lowest new quality level affects both total average quality and quantity and their valuations on the margin.

(2) A social welfare maximizer looks at this same relation, but on the integral.

(3) Average quality may rise over time in social welfare models.

(4) Average quality falls over time in rent maximization models.

(5) Results (3) and (4) and that $\bar{Q}$ is single peaked implies that the minimum quality standard chosen by a professional group or industry will always exceed the socially optimal level.

In addition to these general results, this vintage occupational licensure model also shows that pass rates rise as the intercepts of linear demand functions (α) increase, when the objective is to maximize social welfare. Pass rates do not change at all with shifts in the demand intercepts for any of the other three models. Another sharp result is that the pass rate rises with the marginal valuation of quality (β) in social welfare or rent seeking models, but it does not change at all in either of the quality models. Unfortunately, however, this result is not testable since β is not observable. In addition, in either a social welfare, a rent seeking, or a maximizing quality model, the pass rate falls when the number of applicants ($\hat{N}_1$) rises. However, the pass rate does not change with the number of applicants under quality maintenance. Finally, as the percentage of aged lawyers rises, the pass rate falls in social welfare, falls or rises in rent seeking, only rises in maximizing quality, and does

not change in maintaining quality. Therefore, the vintage occupational licensure model provides the first empirically testable predictions on occupational licensure, testable through changes in α, δ, and $\hat{N}_1$, which are examined in the following chapter.

CHAPTER III

EMPIRICAL EVIDENCE ON OCCUPATIONAL LICENSURE

Other Empirical Occupational Licensure Literature

As would be expected, since little theoretical work has been done on the behavioral role of pass rates in self-licensed professions, little empirical work has been done on this subject as well. Empirical scholars have examined many interesting issues arising with occupational licensure, but only two scholars have specifically addressed the role of entrance exams. More importantly, none of these papers test whether the professions may actually pursue other objectives besides rent maximization.

In terms of the broad occupational licensure literature, empirical scholars have investigated the position of physicians between the competitive and monopoly benchmarks[1], impacts of licensure on geographic mobility,[2] and effects of interstate

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[1] Noether, Monica (1986), "The Growing Supply of Physicians: Has the Market Become More Competitive?," Journal of Labor Economics, 4: 503-537.

[2] Holen, Arlene (1965), "Effects of Professional Licensing Arrangements on Interstate Labor Mobility and Resource Allocation," Journal of Political Economy, 73: 492-498.

reciprocity on dentists' income.[3] Researchers have compared relationships between the year of licensure and the professions' size and income.[4] In the legal market, they have examined whether cobweb patterns appear, the law schools' speeds of adjustment to shifts in the demand for lawyers, and a mechanism for sorting attorneys by quality.[5] Scholars have shown eyeglass prices are 25 to 100 percent higher where optometrists' advertising is prohibited.[6] They have also studied the effects of intra-professional competition in the eyeglass industry and its relationship to professional mix and eyeglass prices.[7] However, underlying all of these empirical occupational licensure papers is the assumption that professions act as cartels. Much of this empirical work adds support to this theory, but none of these papers test whether the professions may actually pursue other objectives besides rent maximiztion. In addition, only the papers by Arlene Holen and Alex Maurizi use pass rate data to

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[3] Shepard, Lawrence (1978), "Licensing Restrictions and the Cost of Dental Care," Journal of Law and Economics, 21: 187-201.

[4] Stigler, George (1971), "The Theory of Economics Regulation," Bell Journal of Economics and Management Science, 2: 3-21. Moore, Thomas G. (1961), "The Purpose of Licensing," Journal of Law and Economics, 4: 93-117.

[5] Pashigian, B. Peter (1977), "The Market for Lawyers: The Determinants of the Demand for and Supply of Lawyers," Journal of Law and Economics, 20: 53-85. Spurr, Stephen J. (1987), "How the Market Solves an Assignment Problem: The Matching of Lawyers with Legal Claims," Journal of Labor Economics, 5: 502-532.

[6] Benham, Lee K. and Alexandria Benham (1975), Regulating Through the Professions: A Perspective on Information Control, Journal of Law & Economics, 18: 421-447.

[7] Maurizi, Alex, Ruth L. Moore, and Lawrence Shepard (1981), "Competing for Professional Control: Professional Mix in the Eyeglasses Industry," Journal of Law and Economics, 24: 351-364.

investigate the role of examinations as the major entry barriers. These two papers also assume cartel-like behavior so they similarly do not use the pass rate data to discern between other possible behavioral models of self-licensed behavior.

Previous Empirical Research Using Pass Rate Data

The first paper to use pass rate data to study licensed professions is the one written by Arlene Holen[8]. Arlene Holen's paper relates licensing arrangements to restrictions of interstate mobility and support the cartel theory of licensure. The percentages of dentists, lawyers, and physicians who reported moving between 1949 and 1950 were calculated from Census figures. She found physicians were much more mobile than dentists and attorneys, both within and between states. She argued dentists and lawyers evidence low mobility because of the greater exclusionary practices of their professions. Holen uses a sample of 23 states included in the National Income Division surveys of medical, dental, and legal incomes in the late 1940s. From this sample, she calculates the correlation coefficients between the failure rates and average state incomes (as reported below). The doctors' ease of mobility explains the lack of correlation for doctors and corroborates her mobility results.

I have two main criticisms of Holen's work. First, I can not reproduce her results even using the same data which she published in her paper. I obtain lower values for the positive correlations and I observe a strong negative correlation for

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[8] Supra at 2.

physicians, both of which weaken the support for cartel-like behavior among professions. Furthermore, even if I could reproduce her results, showing failure rates and income are positively correlated does not establish that professions maximize profits. All it establishes is that there is a positive relationship. We can have a

Table 3.1
Migration, Failure Rates, and Professional Income

	Pct that Moved to Another		Corr. Coeff. for Failure Rate and Ave. State Income	
	County	State	Holen	Guira
Dentists	38%	1%	+0.53	+0.39
Lawyers	36%	2%	+0.73	+0.55
Physicians	68%	7%	(Not Reported)	-0.56

positive relationship between failure rates and income if some states demand higher quality lawyers. The states demanding higher quality lawyers raise their minimum quality standard. Higher quality, higher income and higher failure rates result as by-products.

The second paper to use examination statistics was written by Alex Maurizi.[9] Maurizi compared failure rates with the 'excess demand to enter a profession', which he defined as the ratio of new applicants to the number of currently licensed

[9] Maurizi, Alex (1974), "Occupational Licensing and the Public Interest", Journal of Political Economy, 82: 399-413.

professionals. His data source was the Council of State Governments' 1952 report,[10] a collection of data for 18 licensed occupations in 1940 and 1950. He obtained a significant negative relationship between the pass rate and 'excess demand for entry' for 8 professions in 1940 and 8 professions in 1950. In the 1940 regression, the relationship was significantly positive.

He then used data on average state income of the professions which were available for 8 states in 1940 and 10 states in 1950. Maurizi predicted the failure rate to be higher in a higher income state because they would have more to lose by allowing easier entry. Maurizi showed failure rates rose with the average income of practioners in about half of his regressions. Unfortunately, there were also some regressions with the opposite sign for the income coefficient, three of which were significant.

My major criticism of Maurizi's research is that his results do not tell us anything more than those of Holen in showing a positive relationship between failure rates and a profession's income. States with a higher demand for quality will have higher quality and pay more for it. A positive relationship between failure rates and professional income is not inconsistent with the profession's argument that they are simply maintaining quality.

In additional, Maurizi's measure of demand for entry confounds the effects of the number of applicants and the existing stock of professionals. When his 'entry

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[10] Council of State Governments (1952), Occupational Licensing in the States, Chicago: Council of State Governments.

demand' increases, we do have support for cartelization theory. However, since quality plays a role in the choice of pass rate, it is possible that as the number of applicants increases, the group's quality declines. The bars could fail more applicants in response to a decrease in quality, not the increase in number of applications. A much better approach would be to examine the relationship between the pass rate and variables which are quality invariant and to separate out the two effects of the number of applicants and the existing stock of professionals.

Choice of Subject Group

In order to test the predictions of the four vintage licensure models and to attempt to go beyond the earlier empirical research, I first needed to identify a subject group. I chose lawyers as the subject group for several reasons. First, for purposes of testing these theoretical results, it is impossible to obtain data on the actual quality of the worst applicant (a_o or a_1) for any profession. Nonetheless, data on pass rates in the legal profession are readily available. The Board of Bar Examiners has collected data on the pass rates of the individuals who took bar exams across all fifty states from 1932 to the present. Assuming there is no change in the distribution of quality and the supply of applicants, as the quality of the worst entrant (a_1) rises, the pass rate always falls, and vice versa. Therefore, the comparative static results for the pass rate will be exactly opposite of those for a_1.

In addition, the legal profession exhibits characteristics that, according to the capture theory of regulation which is discussed below, make it more likely to act as

a rent-seeker than other professions. Most of the economics literature argues licensed professions act as rent seekers. Therefore, it seemed most likely that I would obtain robust results using a profession most likely to act like a rent seeker.

To elaborate on the capture theory of regulation, as labelled by George Stigler[11], this theory argues that regulation is operated and designed for the benefit of those regulated. Licensed professions 'buy' regulation from their legislators and 'pay' for it with votes and resources. Such a theory predicts that larger groups and groups with higher incomes are licensed first.

Attorneys' incomes are high and their group size is large relative to other groups.[12] With high incomes, they have more financial resources for lobbying and have greater net gains for a given percentage increase in income. Furthermore, a large portion of the politicians who would need to be persuaded to remove licensing authority are attorneys themselves.[13] Attorneys are always regulated by the highest

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[11] Stigler, George J. (1971), "The Economic Theory of Regulation," Bell Journal of Regulation, 2: 3-21.

[12] In 1960, attorneys had the third highest median earnings of the licensed professions, falling behind physicians and dentists. Id. at 13.

[13] Between 1877 and 1934, 74% of American Presidents and Cabinet officials were lawyers. Lawyers also composed 50% of the US Senate from 1947-1954, 56% of the US House of Representatives in 1949-51, and 25% of state legislators between 1900 and 1954. Matthews, Donald (1954), The Social Background of Political Decision-Makers, Garden City, NJ: Doubleday and Co., page 30, Jewell, Malcolm and Samuel C. Patterson (1966), The Legislative Process in the United States, New York, NY: Random House. p. 107, and Keefe, William J. and Morris S. Ogul (1977), The American Legislative Process: Congress and the States, Englewood Cliffs, NJ: Prentice-Hall, page 119. More recent statistics could not be found but are assumed to be similar.

court of each state, not an independent licensing board, therefore, even the legislative authority for licensing attorneys differs from that of other professions.[14] Florida, for example, licenses all professions but attorneys through the Division of Professional Regulation.[15] The statutory justification for regulating attorneys by the Florida Supreme Court instead of through an independent agency is that attorneys have a judicial as opposed to a legislative function so they are best governed by the judicial branch of government. All three factors, income, size, and influence over law makers, suggest attorneys may have the most influence over their legislators and find it easier to capture them than any other professionally licensed group.

We also expect the amount of entry restriction any profession obtains to be constrained by the threat of opposition from other groups. Most lawyers have private practices so their customers are dispersed.[16] Mobilization of dispersed groups is costly and, individually, each consumer has little benefit from political action. Thus, from this we expect that, relative to other licensed professions, lawyers would have among the lowest levels of opposition to their licensure from other groups.

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[14] Morgan, Thomas D. and Ronald D. Rotunda (1987), Professional Responsibility, 4th ed., Mineola, NY: The Foundation Press, Inc., page 28.

[15] FL. Stat. § 458.003 (1a).

[16] Of 542,205 attorneys in 1980, 68% had private practices. Four percent were employed by the judiciary, 9% by the government, 10% by private industry, 4% by educational institutions, legal aid groups, as public defenders, or special interest organizations. The remaining 5% were retired or inactive. This distribution is approximately the same in 1970. In 1960 and before, even greater percentages of attorneys were in private practice. American Bar Association (1985) The Lawyer Statistical Report: A Statistical Profile of the U.S. Legal Profession, Chicago, IL: American Bar Foundation, page 12.

Third, lawyers are quite consistent in terms of applying their self-regulatory rules across the United States. Most other professions' regulatory rules vary across the states in terms of which professions are actually licensed, who writes and administers the entrance examinations, and who serves on the professions' licensing boards. These factors stay relatively constant in the legal profession.

In terms of regulatory consistency, attorneys are licensed in all states, but each state requires new lawyers to take and pass its own state specific examination. This is not the case for all professions. The professions also vary in terms of which professions require state-specific, national, or both type of tests across and within the states. For example, as illustrated in Table 3.2, Florida requires 14 licensed professions to take both a national and a state exam, 12 to take a national exam, and 34 to take a state exam. Therefore, lawyers make a good subject group since they are consistent in the sense that they require both a state-specific and a national examination in states. The system is essentially the same but the passing standard differs across the states. This makes the pass rate a particularly good indicator of changes int he barriers to entry in the legal profession.

In addition, the fact that attorneys require both types of exams is also significant from a rent-seeking perspective. The state specific exam requirement can be justified since state laws all differ. But since the examinations are always written and administered by the attorneys themselves, they have the opportunity to use the test for income maximization purposes.

Table 3.2
Examination Requirements for Professions
Regulated in the State of Florida, 1989-90

Professions Required to Pass Both a State and a National Examination

1. Acupuncturists
2. Attorneys
3. Chiropractors
4. Dentists
5. Embalmers
6. Funeral Directors
7. Land Surveyors
8. Landscape Architects
9. Nursing Home Administrators
10. Opticians
11. Optometrists
12. Pharmacists
13. Psychologists
14. Veterinarians

Professions Required to Pass a National Examination

1. Accountants
2. Architects
3. Clinical Social Workers
4. Engineers
5. Mental Health Counselors
6. Nurses
7. Occupational Therapists
8. Osteopathic Physicians
9. Physical Therapists
10. Physicians
11. Physician's Assistants
12. Respiratory Therapists

Professions Required to Pass a State Examinations

1. Air Conditioning Contractors
2. Asbestos Contractors
3. Auctioneers
4. Barbers
5. Behavior Analysts
6. Contractors, General
7. Contractors, Building
8. Contractors, Residential
9. Contractors, Specialty Structure
10. Cosmetologists
11. Cosmetology Instructors
12. Dental Hygienists
13. Electricians
14. Emergency Medical Technicians
15. Geologists
16. Harbor Pilots
17. Hearing Aid Specialists
18. Marriage and Family Therapists
19. Masseurs and Masseuses
20. Naturopaths
21. Plumbers
22. Podiatrists
23. Pool Contractors, Residential
24. Pool Contractors, Commercial
25. Pollution Storage Specialists
26. Property Appraisers
27. Real Estate Agents
28. Real Estate Brokers
29. Roofing Contractors
30. School Psychologists
31. Service Pool Specialists
32. Sheet Metal Contractors
33. Solar Water Contractors
34. Underground Utility Contractors

SOURCE: Telephone Conversation with Ms. Mary Alice Palmer, Bureau Chief, Examination Services Bureau, Florida Department of Professional Regulation, on June 19, 1990.

Finally, only two other published studies consider the market for attorneys.[17] Pashigian's paper was a time-series analysis of the legal profession which concluded the major determinant of demand for legal services is rapid growth in real gross national product and that there is a slow supply adjustment in the legal profession. Spurr developed a sorting model in which it is optimal to assign larger claims to higher quality lawyers and used this model to explain promotion and tenure in the legal profession. Neither paper addressed the role of pass rates in relation to models of a profession's choice to limit entry.

In sum, the legal profession was chosen as the subject group for this dissertation since it has readily available pass rate data, according to the capture theory of regulation it is more likely to act as a rent-seeker than other professions, it is consistent in applying its self-regulatory rules across the United States, and little has been published on attorneys. All four factors make attorneys an ideal group to study.

Historical Patterns in the Legal Profession

The legal profession has changed dramatically in the last century. To briefly illustrate these changes, I have gathered time series data which describe these changes and illustrate a couple of distinct shifts in the legal population. Since the purpose of this empirical chapter and this thesis is to specifically test the vintage occupational licensure models, extensive time series analysis would exceed the scope

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[17] Supra at 5.

of this thesis. However, it is of some value on an introductory, illustrative basis to describe entry into the profession and to determine how the pass rates have changed over time.

As shown in Table 3.3 and Figure 3.1, the per capita legal population fell during the first two decades of the century but, after 1920, has steadily increased from a level of 1,151 lawyers per million citizens to 2,821 lawyers per million citizens in 1985. The total number of persons sitting for bar examinations in the United States has followed a very similar pattern as illustrated in Table 3.4 and Figure 3.2. The only major difference is that the flow of examinees was dramatically affected by World War II. As would be expected, there was a sharp drop-off in the number of examinations taken during 1943 through 1947 since young men deferred their careers until after the war. A dramatic increase in examinations occured post-World War II when these war veterans began their careers. As shown in Table 3.5 and Figure 3.3, the actual admissions into the legal profession per million population has also followed this same pattern. The lowest number of examinees, 1712, coincided with World War II. Since that time, the number admitted nationally steadily increased to a height of 46,000 in 1988. There are some significant deviations between examinees and admissions, however. These differences between the series are particularly obvious during the 1980s when the number of examinees per million population continued to increase while the actual admissions dropped dramatically. This created a dramatic drop in the pass rate during that period. These changes in the pass rate are of particular relevance to the vintage occupational licensure model since pass

Table 3.3
Per Capita Lawyer Population, National, 1890-1985

YEAR	POPULATION	LAWYER POPULATION	LAWYER POPULATION PER MILLION POPULATION
1890	62,948,000	89,630	1,424
1900	76,094,000	114,703	1,507
1910	92,407,000	114,704	1,241
1920	106,466,000	122,519	1,151
1930	123,188,000	160,605	1,304
1940	132,122,000	179,554	1,359
1951	154,878,000	221,605	1,431
1954	163,026,000	241,514	1,481
1957	171,984,000	262,320	1,525
1960	180,671,000	285,933	1,583
1963	189,242,000	296,069	1,564
1966	196,560,000	316,856	1,612
1970	205,052,000	355,242	1,732
1980	227,757,000	542,205	2,381
1981	230,138,000	569,000	2,472
1982	232,520,000	595,000	2,559
1983	234,799,000	621,000	2,645
1984	237,001,000	649,000	2,738
1985	239,279,000	675,000	2,821

SOURCES: POPULATION: U.S. Bureau of the Census (1989), Statistical Abstract of the U.S., Washington, DC: U.S. Bureau of the Census, page 7. (For the years 1947-1988.) American Bar Foundation (1963), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1947.) LAWYER POPULATION: American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation p. 21. (For the years preceding 1980.) American Bar Foundation (1985), The Lawyer Statisical Report, Chicago, IL: American Bar Foundation, page 4. (For the years 1980-85.)

NOTE: For more precise definitions, see Appendix B.

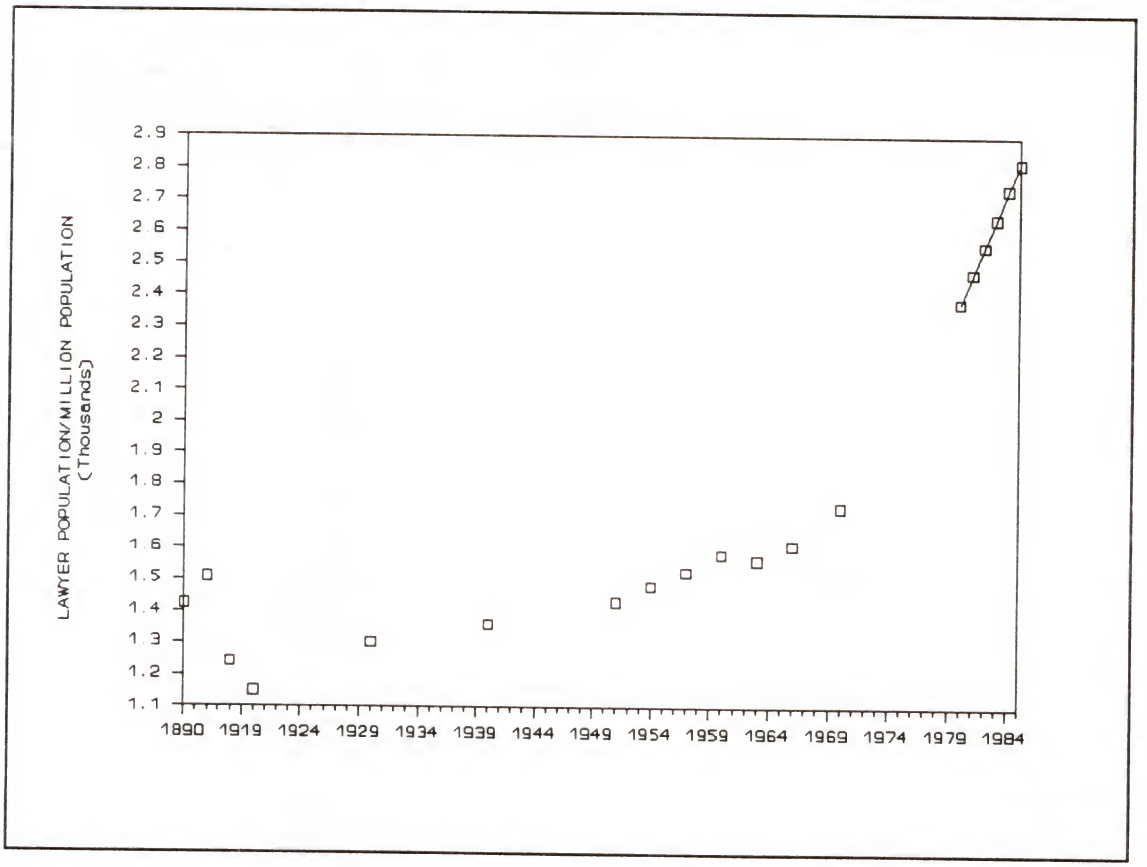

Figure 3.1
Lawyer Population Per Million Population

Table 3.4
Total Number of United States Citizens Taking State Bar Examinations Per Million Population

YEAR	EXAMINEES PER MILLION POPULATION	YEAR	EXAMINEES PER MILLION POPULATION
1930	161.65536		
1931	153.19495	1961	87.11913
1932	155.82358	1962	83.54866
1933	145.70769	1963	84.81732
1934	141.97731	1964	90.40122
1935	132.00170	1965	96.25688
1936	128.21713	1966	106.84269
1937	128.94596	1967	115.67495
1938	129.17696	1968	126.01517
1939	121.99683	1969	130.60189
1940	110.36012	1970	120.34508
1941	102.92200	1971	134.37285
1942	73.29824	1972	156.82052
1943	32.98254	1973	186.43852
1944-46	Unavail.	1974	204.80328
1947	67.62075	1975	214.90649
1948	110.90438	1976	225.18862
1949	129.23967	1977	235.97092
1950	132.08687	1978	260.48476
1951	127.13878	1979	256.27513
1952	113.42850	1980	254.83300
1953	101.23982	1981	257.70190
1954	122.34245	1982	272.40237
1955	89.28410	1983	276.30867
1956	92.00547	1984	271.80898
1957	85.65913	1985	279.42695
1958	91.94200	1986	278.92539
1959	93.80869	1987	276.52256
1960	88.56430	1988	275.84077

SOURCES: POPULATION: U. S. Bureau of the Census (1989), Statistical Abstract of the U.S., Washington, DC: U.S. Bureau of the Census, page 7. (For the years 1947-1988.) American Bar Foundation (1963), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1947). EXAMINEES: American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1961.) American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 20. (For the years 1961-1969.) National Conference of Bar Examiners (1970-88), The Bar Examiner, Chicago, IL: The National Conference of Bar Examiners. (For the years 1970-88. Data appears annually in various tables.)

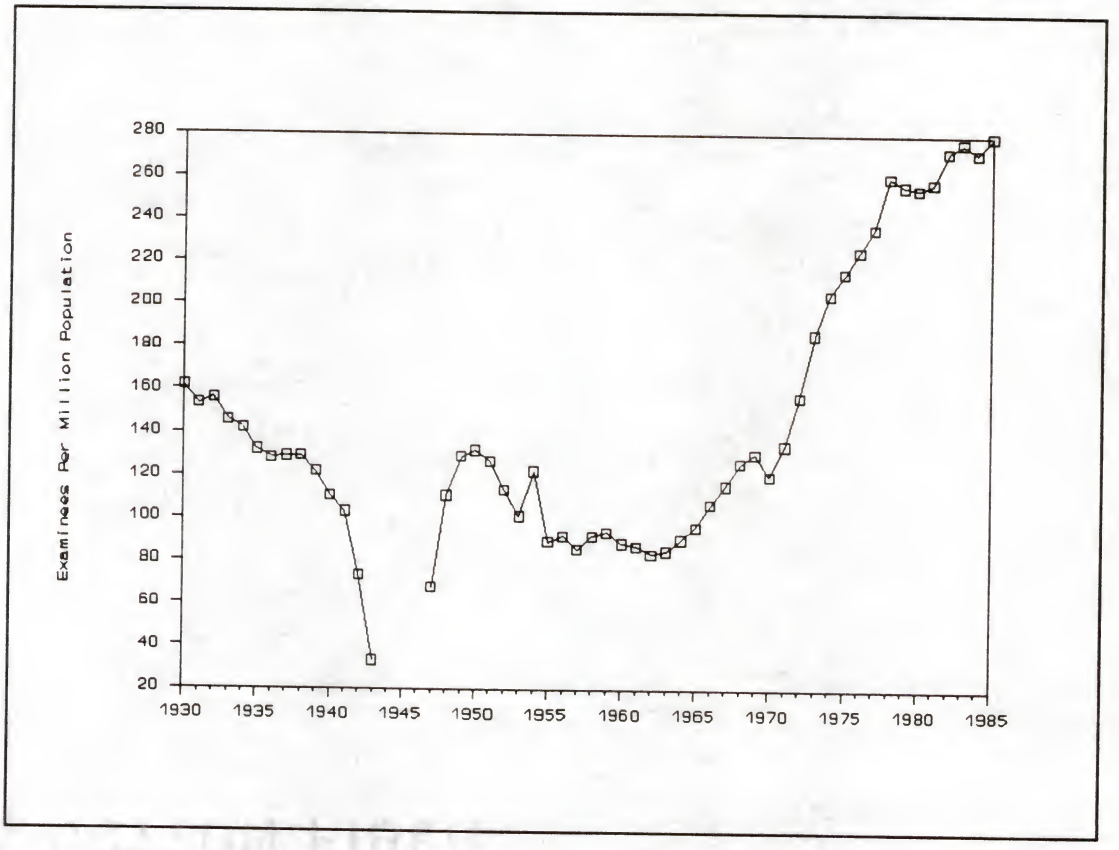

Figure 3.2
Examinees Per Million Population,
National, 1930-88

Table 3.5
Admissions by Examination, National, 1920-88

YR.	ADMIS. BY EXAM	EXAM ADMIS. per Million POPUL.	YR.	ADMIS. BY EXAM	EXAM ADMIS. per Million POPUL.
1920	5,117	48.06	1941	7,224	54.15
1921	5,191	47.83	1942	5,765	42.75
1922	6,019	54.69	1943	2,467	18.04
1923	6,012	53.70	1944	1,712	12.37
1924	6,699	58.70	1945	1,946	13.91
1925	7,321	63.20	1946	3,725	26.35
1926	8,499	72.39	1947	5,732	39.78
1927	8,825	74.14	1948	9,882	67.35
1928	9,272	76.94	1949	11,773	78.85
1929	8,947	73.48	1950	12,015	78.90
1930	9,559	77.60	1951	11,568	74.69
1931	9,129	73.53	1952	10,465	66.42
1932	8,774	70.22	1953	9,696	60.53
1933	8,494	67.58	1954	8,968	55.01
1934	8,245	65.19	1955	8,746	52.71
1935	8,149	63.98	1956	8,651	51.22
1936	7,651	59.69	1957	8,815	51.26
1937	7,989	61.95	1958	9,695	55.44
1938	8,105	62.36	1959	10,142	57.03
1939	8,102	61.83	1960	9,992	55.30
1940	7,414	56.12			

SOURCES: POPULATION: U.S. Bureau of the Census (1989), Statistical Abstract of the U.S., Washington, D.C.: U.S. Bureau of the Census, page 7. (For the years 1947-1988.) American Bar Foundation (1963), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1947.) ADMISSIONS BY EXAMINATIONS: American Bar Foundation, 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years 1920-1960.) American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 20. (For the years 1961-1969.) The National Conference of Bar Examiners. (For the years 1970-88. Data appears annually in various tables.)

Table 3.5, Cont.
Admissions by Examination,
National, 1920-88

YR.	ADMIS. BY EXAM	EXAM ADMIS. per Million POPUL.	YR.	ADMIS. BY EXAM	EXAM ADMIS. per Million POPUL.
1961	10,178	55.41			
1962	10,192	54.64	1976	34,951	160.30
1963	10,358	54.73	1977	36,463	165.56
1964	11,676	60.85	1978	38,319	172.15
1965	12,753	65.64	1979	41,903	186.19
1966	14,236	72.43	1980	41,105	180.48
1967	15,579	78.40	1981	41,442	180.08
1968	17,256	85.98	1982	42.479	182.69
1969	18,656	92.05	1983	43,369	184.71
1970	17,394	84.83	1984	33,986	143.40
1971	20,004	96.33	1985	36,348	151.91
1972	24,447	116.47	1986	37,595	155.60
1973	29,903	141.11	1987	39,365	161.39
1974	33,358	155.98	1988	45,999	186.90
1975	34,144	158.09			

SOURCES: POPULATION: U.S. Bureau of the Census (1989), Statistical Abstract of the U.S., Washington, D.C.: U.S. Bureau of the Census, page 7. (For the years 1947-1988.) American Bar Foundation (1963), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1947.) ADMISSIONS BY EXAMINATIONS: American Bar Foundation, 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years 1920-1960.) American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 20. (For the years 1961-1969.) The National Conference of Bar Examiners. (For the years 1970-88. Data appears annually in various tables.)

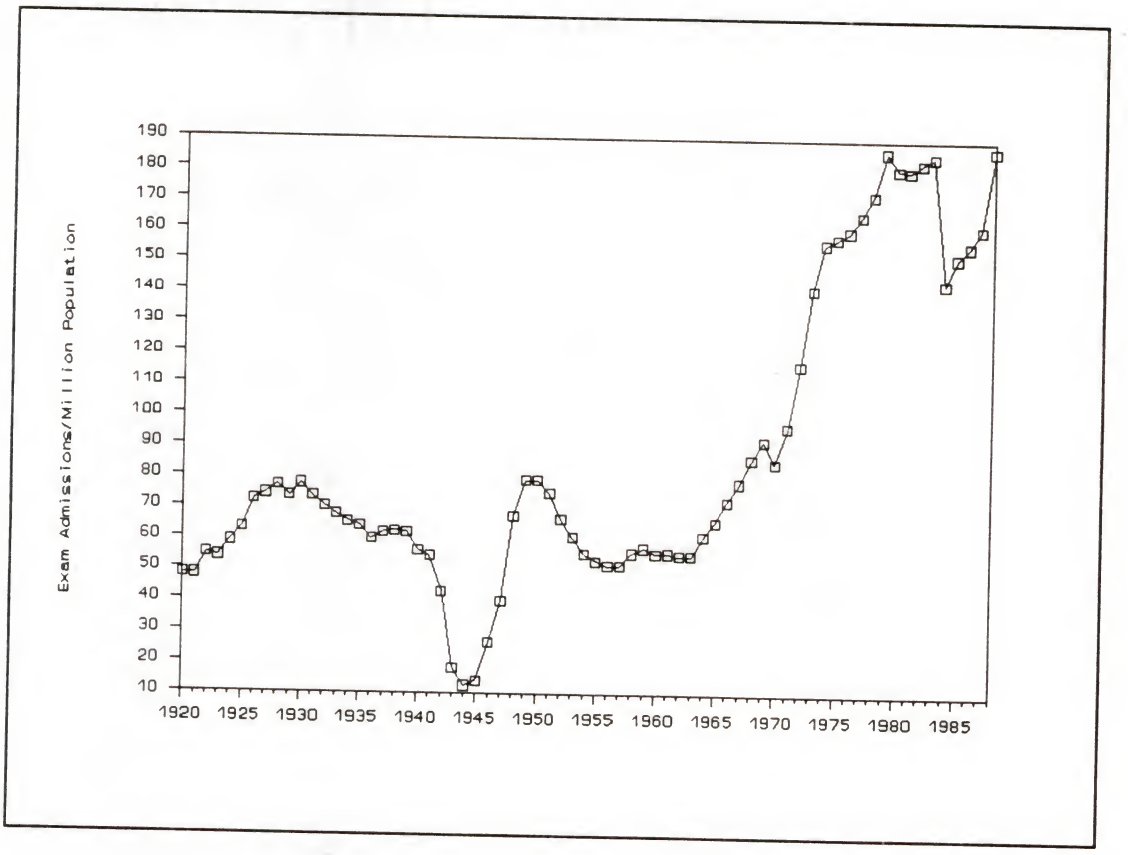

Figure 3.3
Exam Admissions Per Million
Population, National, 1920-88

rates are the only variable to have theoretical significance over time. Changes in the pass rate will be evaluated in the next section.

Finally, when controlling for both the changes in population and number of lawyers, we observe more of an oscillating pattern in the number of examinees. As seen in Table 3.6 and Figure 3.4, the ratio of examinees to the United States population and number of lawyers rose in the forties, fell in the fifties, rose in the sixties, and then fell in the eighties. (Data are unavailable for the seventies.) Not much can be said only on the face of this evidence since there are many factors which could explain this variation. Nonetheless, the extent of this variation suggests there are a number of possible forces at work in the market and provides further motivation to use this profession for purposes of testing the vintage licensure model.

Changes in the Pass Rate

As previously mentioned, the most important purpose behind examining the historical patterns of entry into the legal profession is that it allows us to examine changes in the pass rate over time. As discussed in Chapter II, the vintage licensure model's results on the lower bound relations create implications for how the pass rates should behave over time in the four models. Under social welfare maximization, the pass rate ($1-F(a_1)$) can either decline or rise over time since either $a_1 \geq a_o$ or $a_1 \leq a_o$. Under rent maximization or quality maximization, the pass rate will always decline over time since $a_1 > a_o$. Thus, strikingly, if the quality of the worst

Table 3.6
Ratio of Examinees to
Lawyers, National, 1930-85

YEAR	RATIO OF EXAMINEES TO LAWYERS	YEAR	RATIO OF EXAMINEES TO LAWYERS
1930	0.1240	1970	0.0695
1940	0.0812	1980	0.1070
1951	0.0889	1981	0.1042
1954	0.0826	1982	0.1065
1957	0.0562	1983	0.1045
1960	0.0560	1984	0.0993
1963	0.0542	1985	0.0991
1966	0.0663		

SOURCES: POPULATION: U. S. Bureau of the Census (1989), Statistical Abstract of the U.S., Washington, DC: U.S. Bureau of the Census, page 7. (For the years 1947-1988.) American Bar Foundation (1963), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1947). LAWYER POPULATION: American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 21. (For the years preceding 1980.) American Bar Foundation (1985), The Lawyer Statisical Report, Chicago, IL: American Bar Foundation, page 4. (For the years 1980-85). EXAMINEES: American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years before 1961.) American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 20. (For the years 1961-1969.) National Conference of Bar Examiners (1970-88), The Bar Examiner, Chicago, IL: The National Conference of Bar Examiners. (For the years 1970-88. Data appears annually in various tables.)

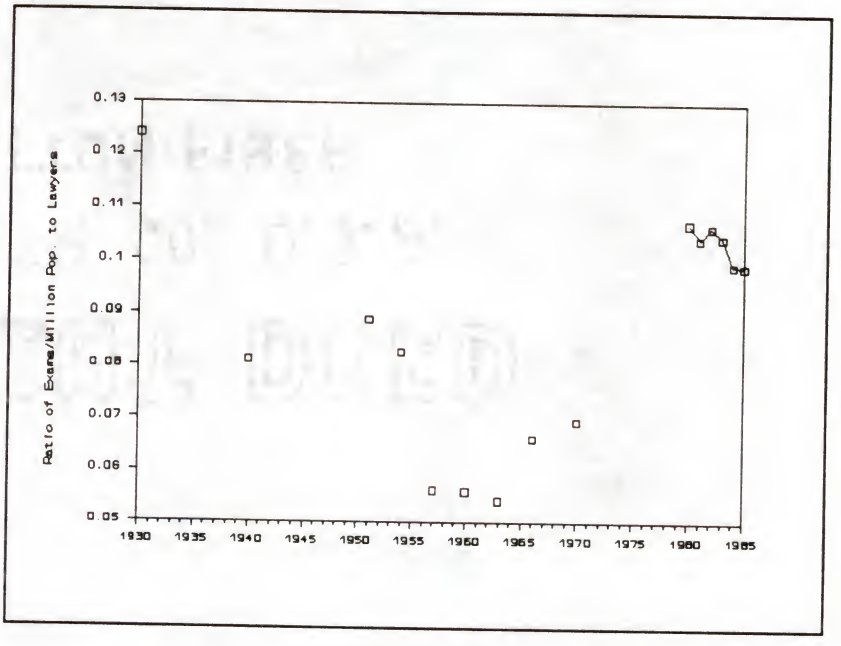

Figure 3.4
Ratio of Examinees Per Million Population
to Lawyers, National, 1930-85

applicant always rises in rent seeking, the pass rate must always fall in rent seeking. Finally, under quality maintenance, the pass rate remains constant since $a_1 = a_o$.

Using data from the state of Florida, it appears that at least this group of attorneys behaved in a manner consistent with the social welfare model until 1974 and after 1982 but they acted as either rent or quality maximizers between 1974 and 1982. As illustrated by Table 3.7 and Figure 3.5, both the first timers' and the repeaters' pass rates followed a generally increasing pattern until the middle 1970s. After this time, pass rates dropped dramatically only to begin rising again in 1982. A falling pass rate between 1974 and 1982 is consistent with either the rent or average quality maximizing models.

One curious feature of the Florida data, however, is that the Florida Bar Examiners chose not to publish their pass rate statistics for the years 1976 to 1981. This is interesting since this was the time of the sharpest down turn in pass rates and leads one to wonder if their choice not to publish these data was intended to hide them.

On a national basis, the pass rates have been rising as well as shown in Table 3.8 and Figure 3.6. These data are aggregate, averaging the first-timers' and repeaters' pass rates together. The national pass rate trend mirrors the specific case of Florida and is even more striking since the data series is complete. The data show a steadily increasing pass rate until the mid-seventies and a generally falling pass rate since that time, indicating behavior consistent with the social welfare model for 1932 through 1974 and with the rent or quality maximizing model since 1975.

Table 3.7
Florida's First Timers, Repeaters and Their Pass Rates, 1940-1988

YEAR	NUMBER OF FIRST-TIMERS EXAMINED	NUMBER OF FIRST-TIMERS ADMITTED	FIRST-TIMERS' PASS RATES	NUMBER OF REPEATERS EXAMINED	NUMBER OF REPEATERS ADMITTED	REPEATERS' PASS RATES
1940	44.00	16.96	0.39	43.00	13.99	0.33
1941	51.00	32.96	0.65	41.00	11.06	0.27
1942	33.00	12.03	0.36	36.00	12.08	0.34
1943	13.00	8.04	0.62	8.00	0.99	0.12
1944-47	Not Available					
1948	101.00	76.76	0.76	13.00	5.04	0.39
1949	101.00	80.12	0.79	18.00	10.98	0.61
1950	Not Available					
1951	85.00	33.40	0.39	30.00	20.00	0.67
1952	103.00	66.18	0.64	18.00	7.02	0.39
1953	103.00	66.18	0.64	28.00	12.98	0.46
1954	218.00	146.88	0.67	35.00	21.07	0.60
1955	229.00	174.83	0.76	84.00	49.95	0.59
1956	339.00	281.37	0.83	59.00	20.93	0.35
1957	388.00	297.60	0.77	79.00	34.76	0.44
1958	441.00	337.95	0.77	172.00	99.36	0.58
1959	407.00	288.28	0.71	118.00	33.06	0.28
1960	401.00	367.23	0.92	128.00	83.99	0.66
1961	379.00	302.83	0.80	53.00	21.81	0.41
1962	440.00	371.30	0.84	74.00	33.03	0.45
1963	402.00	353.76	0.88	63.00	35.91	0.57
1964	489.00	426.90	0.87	71.00	48.24	0.68
1965	451.00	414.60	0.92	67.00	38.17	0.57
1966	526.00	489.60	0.93	53.00	35.92	0.68
1967	587.00	503.71	0.86	60.00	34.10	0.57
1968	752.00	655.51	0.87	74.00	50.19	0.68
1969	789.00	728.37	0.92	89.00	71.77	0.81
1970	884.00	832.59	0.94	45.00	34.05	0.76
1971	1020.00	941.75	0.92	84.00	55.07	0.66
1972	1037.00	954.04	0.92	62.00	27.16	0.44
1973	1789.00	1629.66	0.91	153.00	88.33	0.58
1974	1972.00	1804.57	0.92	196.00	99.38	0.51
1975	2157.00	1810.27	0.84	164.00	79.28	0.48
1976-81	Not Available					
1982	2163.00	1584.99	0.73	543.00	189.99	0.35
1983	2267.00	1761.61	0.78	573.00	212.01	0.37
1984-85	Not Available					
1986	2519.00	1949.07	0.77	608.00	227.07	0.37
1987	2624.00	2007.80	0.77	614.00	259.85	0.42
1988	2509.00	2004.64	0.80	626.00	295.90	0.47

SOURCE: ALL PASS RATE STATISTICS: National Conference of Bar Examiners (1941-1989), The Bar Examiner, Chicago, IL: The National Conference of Bar Examiners (data appears in various tables).

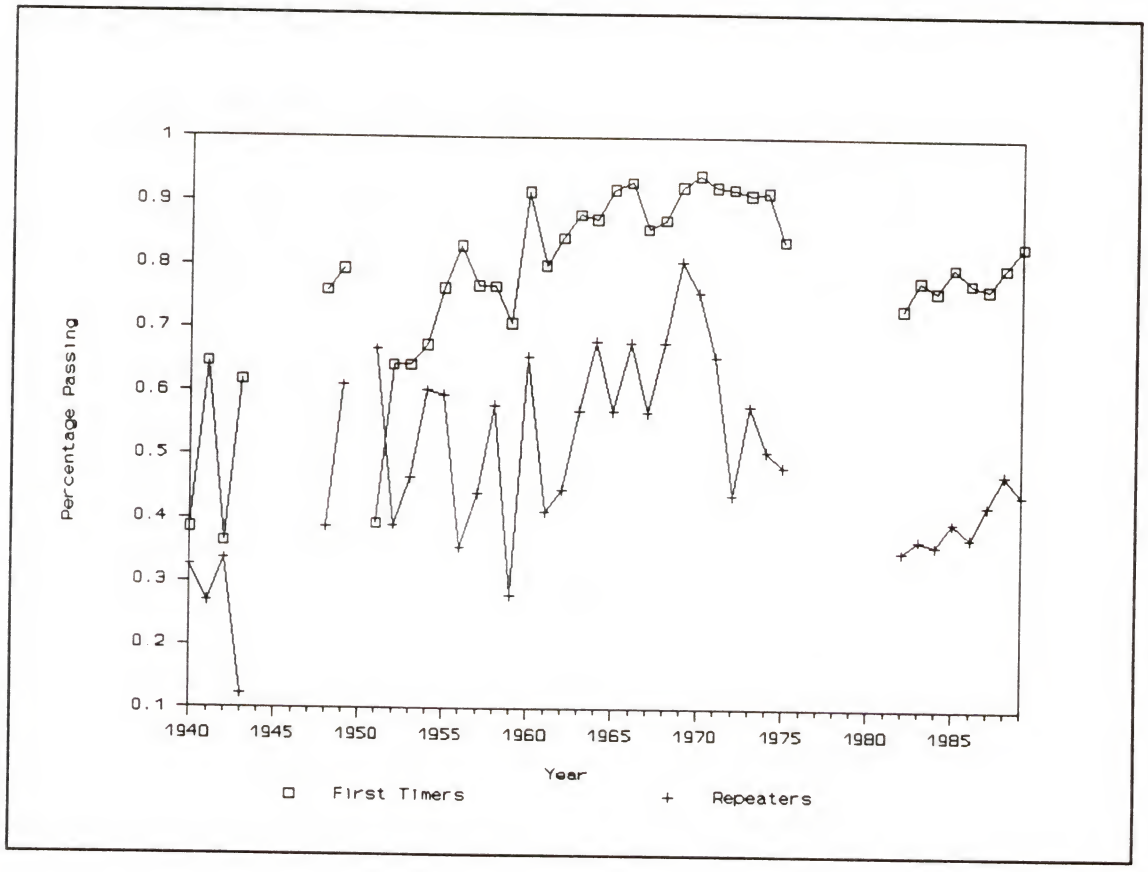

Figure 3.5
First-Timers' and Repeaters' Pass Rates
On Florida's Legal Entrance Exams, 1940-1989

One interesting fact I noticed by recalculating the pass rates from raw data is that there were 8 years in which the reported data and the data I calculated differed sharply. In 1954 and for the 4 years between 1984-87 the pass rates I calculated are markedly lower than those reported. In the 3 years between 1979-1981, the calculated pass rates exceeded those which are reported. Interestingly, all 8 deviations occur at times of relative downturns in the pass rates. If we only saw the 5 positive deviations in 1954 and 1984-87, we would have more support for the theory that Bar Examiners take liberties with their reporting mechanisms when they fail more applicants. But, the fact that the reported pass rates were lower than those I calculated for the 3 years 1979-81, suggests that mis-reporting may not be intentional at all but may be just a function of normal human error when producing data series. Nevertheless, both the Florida and national data suggest that attorneys have consistently raised pass rates in a manner consistent with the social welfare model until 1974. Since 1975, attorneys' behavior with respect to the pass rate fits that of either the social welfare, rent seeking or quality maximizing models.

Tests of the Vintage Occupational Licensure Models

Data Definitions

In this section, I return to the central empirical question of this chapter, that is, how does the pass rate $(1\text{-}F(a_1))$ change with changes in the demand shift parameter (α), the number of applicants $(\hat{N}_1)$, and the depreciation rate (δ)? To address this question, I have compiled pass rate data collected by the United States

Table 3.8
Average Pass Rate, National, 1932-1988

YEAR	EXAM ADM. PER MILLION POPULATION	REPORTED PASS RATE	REPORTED PASS RATE	CALC. MINUS REPORTED PASS RATES
1932	70.22	45	45.06	0.06
1933	67.58	46	46.38	0.38
1934	65.18	45	45.91	0.91
1936	59.69	46	46.55	0.55
1937	61.94	48	48.04	0.04
1938	62.36	48	48.28	0.28
1939	61.83	51	50.69	-0.31
1940	56.11	51	50.85	-0.15
1941	54.15	53	52.62	-0.39
1942	42.74	58	58.32	0.32
1943	18.04	55	54.70	-0.30
1944-46	Not Available			
1947	39.78	58	58.83	0.83
1948	67.35	60	60.73	0.73
1949	78.85	61	61.01	0.01
1950	78.90	60	59.74	-0.26
1951	74.69	59	58.75	-0.25
1952	66.42	59	58.56	-0.44
1953	60.53	60	59.79	-0.21
1954	55.01	56	44.96	-11.04
1955	52.71	59	59.03	0.03
1956	51.22	59	55.67	-3.33
1957	51.25	61	59.84	-1.16
1958	55.43	60	60.30	0.30
1959	57.03	60	60.80	0.80
1960	55.30	62	62.45	0.45
1961	55.40	63	63.60	0.60
1962	54.63	65	65.40	0.40
1963	54.73	64	64.53	0.53
1964	60.85	67	67.31	0.31
1965	65.63	68	68.19	0.19
1966	72.42	68	67.79	-0.21
1967	78.40	68	67.78	-0.22
1968	85.97	68	68.23	0.23
1969	92.05	70	68.23	0.23
1968	85.98	68	68.23	0.23
1969	92.05	70	70.48	0.48
1970	84.82	70	70.49	0.49

SOURCES: PASS RATE: American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years 1930-1960.) American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 20. (For the years 1961-69.) National Conference of Bar Examiners (1970-88), The Bar Examiner, Chicago, IL: National Conference of Bar Examiners. (For the years 1970-88. Data appears in various tables.)

NOTE: For more precise definitions, see Appendix B.

Table 3.8, Cont.
Average Pass Rate, National, 1932-1988

YEAR	EXAM ADM. PER MILLION POPULATION	REPORTED PASS RATE	REPORTED PASS RATE	CALC. MINUS REPORTED PASS RATES
1971	96.33	72	71.69	-0.31
1972	116.47	74	74.27	0.27
1973	141.11	76	75.69	-0.31
1974	155.98	76	76.16	0.16
1975	158.09	74	73.56	-0.44
1976	160	70	71.18	1.18
1977	165.56	70	70.16	0.16
1978	172.15	67.4	66.09	-1.31
1979	186.19	68.8	72.65	3.85
1980	180.07	67.1	70.82	3.72
1981	180.07	65.98	69.88	3.98
1982	182.68	65.2	67.07	1.87
1983	184.70	66.1	66.85	0.75
1984	143.40	64.5	52.76	-11.74
1985	151.90	66	54.36	-11.64
1986	155.60	64.4	55.79	-8.61
1987	161.39	67	58.36	-8.64
1988	186.90	66.4	67.76	1.36

SOURCES: PASS RATE: American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 88. (For the years 1930-1960.) American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, page 20. (For the years 1961-69.) National Conference of Bar Examiners (1970-88), The Bar Examiner, Chicago, IL: National Conference of Bar Examiners. (For the years 1970-88. Data appears in various tables.)

NOTE: For more precise definitions, see Appendix B.

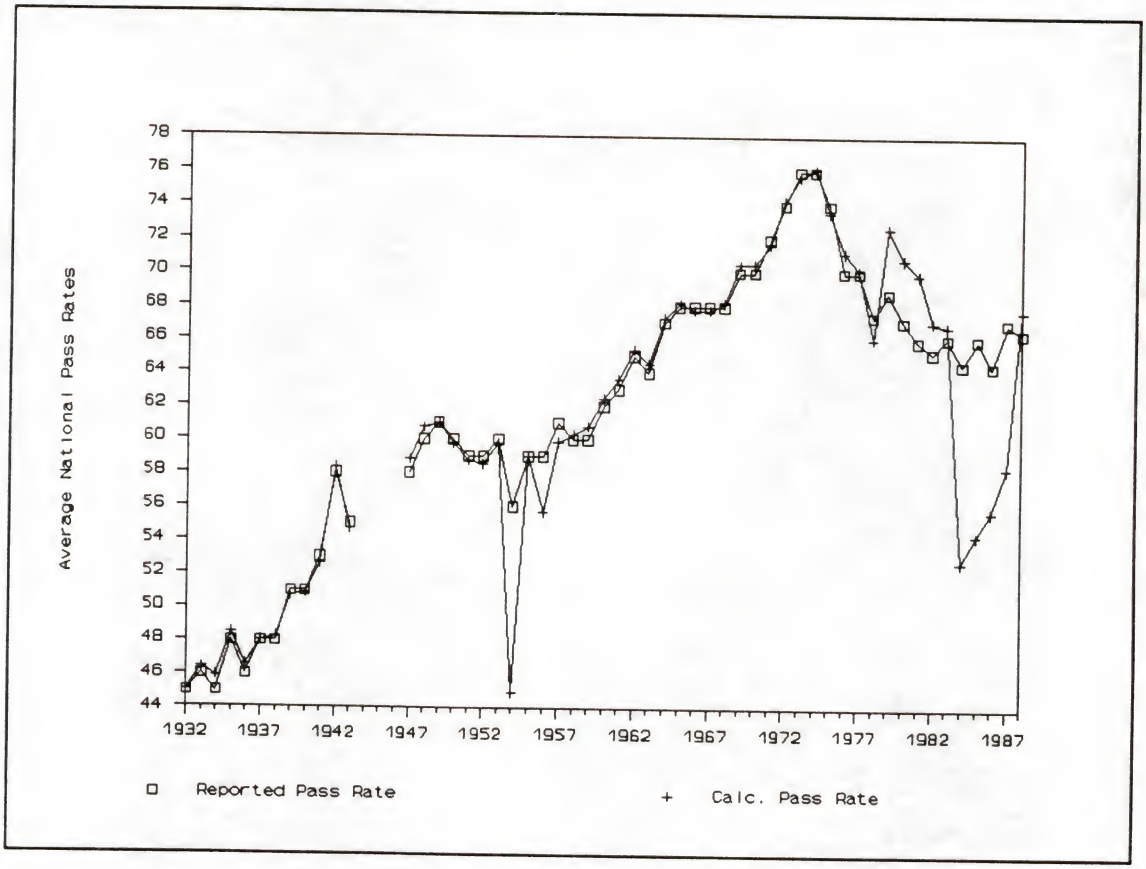

Figure 3.6
Average Aggregate National Pass Rates,
1932-1988

Board of Bar Examiners and data for the α, $\hat{N}_1$, and δ variables from a variety of sources.

The pass rate data ($1 - F(a_1)$) were compiled in percentage terms so the range of possible values is 0 to 100 rather than 0 to 1. As suggested by the time series pass rate data for Florida and the nation, there are no problems with the pass rate data. The data all lie well within the interval and are not clustered at either the top or the bottom, eliminating the need for limited dependent variable techniques. These data are examined using pooled cross-section regressions with the unit of observation being the individual state. Data were collected for the years 1940, 1950, 1960, 1970, and 1980. More frequent observations would have been better because there are structural changes within a decade. However, data was collected in 10 year intervals because data for other critical variables were only available from the United States censi which are only collected on the decade.

Several variables were used to proxy demand for legal services (α). Legal cases are filed on both the state and the federal level. Caseload data for the state level is available only for the year 1975 which makes using this direct data impossible. Instead, I used five proxies of state court activity. The number of people of age 65 and older per total state population proxies legal effort in the estate and trust area (ELDERS). I assume that people are more likely to revise their wills as they reach the age 65 since they expect they are likely to die. Criminal caseload activity is proxied by the number of burglaries (BURG) known to the police per total state population and the percentage of the population living in places of 2500 or more

(URBAN). The justification for associating the degree of urbanization with criminal caseload activity is that as the population becomes more concentrated, there is more anonymity among people, and with increasing anonymity there is a greater likelihood of criminal activity. Civil caseload activity will also be picked up by the degree of urbanization. As there is a greater population concentration, there will be more car accidents, increasing the level of legal activity in the traffic area. There is likely to be an income effect which also drives the demand for legal services. Residents of states with higher real per capita income (PCINC) are likely to spend a larger share of their income on legal services. Finally, the number of divorces (DIV) per total state population reflects a portion of the legal work in the area of family law.

On the federal level, however, proxies are not needed since actual caseload statistics are available. There are four categories of federal cases, appeals, bankruptcy, civil and criminal. Data from each of these categories were compiled and used in terms of number of cases per total state population (APPELP, CRIMP, CIVILP, BANKP).

As mentioned previously, the demand variables provide the most direct test of the four possible models of the legal profession's behavior. For the social welfare model, as the demand shift parameter (α) increases, marginal quality falls, the number of entrants rises, and the percentage passing rises ceteris paribus. In contrast, there is no such direct relationship between increases in demand for professional services and the percentage passing in rent seeking, quality maximizing,or quality maintaining models. The coefficient on demand shifts is zero in those three

Table 3.9
Description of Variables Used in Model 1

Pass Rate ($1-F(a_1)$)

PASSRATE = The percentage passing the bar exam. The number admitted by examination per the number of examinees. Includes both first-time test takers and repeaters. Possible range is 0 to 100.

Demand Variables (α)

ELDERS = The number of people of age 65 and older per total state population.

BURG = The number of burglary offenses known to the police per total state population.

PCINC = Real per capita income for the state.

URBAN = Percentage of the population living in places of 2500 or more.

DIV = Number of divorces per total state population.

APPELP = Number of appeals filed in the U.S. Circuit Courts of Appeals per total state population.

CRIMP = Number of criminal cases commenced in the U.S. District Courts per total state population.

CIVILP = Number of civil cases commenced in the U.S. District Courts per total state population.

BANKP = Number of bankruptcy cases commenced in the U.S. District Courts per total state population.

Number of Applicants ($\hat{N}_1$)

TAKEPP = Number of first-time and repeating test takers per total state population.

Depreciation Rate ($1-\delta$)

AGE = The mean of the population of lawyers and judges for each state. (This variable is used in Model 1A.)

PCTAGE = The percentage of lawyers of age 65 and older. (This variable is used in Model 1B.)

Time Dummy Variables

T1-T4 = The time dummy variables are defined so T1 = 1 if 1940 and T1 = 0 otherwise, T2 = 1 if 1950 and is zero otherwise, T3 = 1 if 1960 and is zero otherwise, and T4 = 1 if 1970 and is zero otherwise.

models. Thus if we observe a positive relationship between the pass rate and the demand shift variables, we have obtained support for the social welfare model over the other three models.

Direct data is available for the number of applicants ($\hat{N}_1$). This data was also collected from the United States Board of Bar Examiners and was used in terms of the number of applicants per total state population. The comparative statics for the changes in the number of applicants predict a negative coefficient for either a social welfare, rent seeking model, or maximizing quality model, but a zero coefficient for maintaining average quality. This means that when the number of applicants rises, if the pass rate remains unchanged, ceteris paribus, we have evidence to support a maintaining average quality model over any of the other three models.

To measure the degree to which the existing legal population aged, I obtained census data on the individual level for attorneys and judges for the census years 1940 through 1980. Fourteen thousand, four hundred and seventy two individual observations were pulled from the census tapes. The mean age of these lawyers and judges for each state and census year were calculated and were used in these regressions (AGE). In addition, an alternative measure of the age effect was constructed by calculating the percentage of lawyers of age 65 and older (PCTAGE). As either the mean rises or the percentage of lawyers of age 65 years or older increases, there will be fewer attorneys retiring so the depreciation rate will fall and δ rises. A negative relationship between the pass rate and δ is predicted for the social welfare model, a positive relationship is predicted in the maximizing quality

model, while either a positive or negative are possible under rent seeking. No relationship between the pass rate and the share of elderly attorneys is predicted for the quality maintenance model.

Dummy variables for the years were also created since the parameters are not stable over time. The dummy variables are defined so that in the year 1940, T1 equals 1, otherwise it equals zero. Likewise, T2 is the dummy variable for 1950, T3 is the dummy variable for 1960, and T4 is the dummy variable for 1970. These variables should be interpreted relative to 1980. Therefore, if the coefficient on T1 is positive and significant, it should be interpreted as the amount that the pass rate has fallen in 1980 relative to the level it had attained in 1940.

Model 1

Results from the regression of the pass rate on demand (α), number of applicants ($\hat{N}_1$), and depreciation (δ) are summarized below in Table 3.10. In terms of the demand variables, we find that there are three variables which are positive and significant (the share of elderly population, ELDERS, the real per capita income of the entire state, PCINC, and the number of federal criminal cases per total state population, CRIMP). One demand variable is significant and negative (the number of federal civil cases per total state population, CIVILP). But for the negative sign observed for CIVILP, the three positive coefficients would have provided strong support for the social welfare model since the predicted sign for the other three models is zero.

Table 3.10
Regression Results from Model 1A,
The Vintage Model Using AGE instead of PCTAGE

Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	15	27465.07586	1831.00506	7.582	0.0001
Error	227	54821.59081	241.50481		
C Total	242	82286.66667			
R-square	0.3338				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	60.66	15.37	3.947***
ELDERS	0.11	0.05	2.114**
BURG	3.16 x 10-8	0.04 x 10-6	0.713
PCINC	0.55	0.28	1.964*
URBAN	-0.09	0.10	-0.920
DIV	0.09 x 10-3	0.02 x 10-2	0.367
APPELP	4,871	50,017	0.097
CRIMP	14,590	5,548	2.630***
CIVILP	-9,553	3,127	-3.055***
BANKP	-3,358	2,173	-1.545
TAKEPP	-102,022	18,086	-5.641***
AGE	0.34	0.27	1.263
T1	-19.99	9.03	-2.215**
T2	-14.39	7.70	-1.869*
T3	-13.67	6.99	-1.956*
T4	- 7.85	4.86	-1.615

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

The variable TAKEPP ($\hat{N}_1$) is negative and very significant. A negative sign is consistent with either a rent seeking or a social welfare model but is inconsistent with either of the average quality models.

The final variable of interest from the vintage occupational licensure model is AGE, defined as the mean age of the lawyer population. The coefficient on this variable appeared to be insignificant in model 1, therefore, AGE can not be used to distinguish between any of the four models. Model 1B represents the same reduced form of the vintage occupational licensure model with the exception that PCTAGE, the share of the legal population which is 65 years or older, replaces AGE, the mean age of the legal population. As the results show, using PCTAGE does not offer any empirical advantage over AGE, in fact, it makes the regression worse. In subsequent regressions, therefore, the variable AGE is used rather than PCTAGE.

All of the time dummies were significant, except for the year 1970. There coefficients can be interpreted to mean that the pass rate has risen over time which supports the social welfare maximization model. For the interval from 1940 to 1980, it rose 20.0%, from 1950 to 1980 it rose 14.4%, and from 1960 to 1980 it rose 13.7%.

In sum, the results of Model 1 could support either a social welfare or a rent seeking model since TAKEPP has the only consistent, significant coefficient and its negative value is consistent with either a rent seeking or a social welfare model. Neither the demand variables or either of the 2 possible age variables help to further separate the results. The time series shifts which are represented by the negative coefficients on the dummy variables support the social welfare model.

Table 3.11
Regression Results From Model 1B,
The Vintage Model Using PCTAGE instead of AGE

Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	15	27286.00588	1819.06706	7.508	0.0001
Error	227	55000.66079	242.29366		
C Total	242	82286.66667			
R-square	0.3316				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	72.67	11.43	6.355***
ELDERS	0.11	0.05	2.280**
BURG	3.14 x 10-8	0.05 x 10-6	0.695
PCINC	0.55	0.28	1.937*
URBAN	- 0.097	0.097	-1.003
DIV	0.96 x 10-4	0.024 x 10-2	0.401
APPELP	14,158	53,424	0.265
CRIMP	14,194	5,594	2.538***
CIVILP	-9,823	3274	-3.000***
BANKP	-3,417	2179	-1.568
TAKEPP	-102,311	18,079	-5.659***
PCTAGE	0.11	0.11	1.008
T1	-17.89	8.87	-2.017**
T2	-12.99	7.59	-1.711*
T3	-11.31	6.70	-1.688*
T4	- 5.73	4.65	-1.232

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Should there be a great degree of correlation between variables, multicollinearity could explain the sign ambiguity and possibly could be used as an argument for deleting some variables which could eliminate this sign ambiguity. Deleting variables is always worrisome, however, since if we omit some of the variables, we may observe other variables to have significant signs, but we then make the estimates of the remaining variables biased by omitting relevant variable. Examining the correlation coefficients between all of the variables in model, I found the greatest degree of correlation between BURG and PCINC. Yet those two variables were only 79.76% correlated. This level of correlation is low, relatively speaking, so multicollinearity is likely not a problem and likely would not justify eliminating variables in attempt to switch the negative coefficient on CIVILP.

To pursue the multicollinearity problem further, it is true that the parameter estimates for federal caseloads, number of applicants, burglary and divorce are large relative to the other variables. Having independent variables with widely varying values is a problem associated with multicollinearity. To check if this possibility could be causing problems, I rescaled the variables to make them comparable in magnitude. As two examples, I divided the per capita burglaries by 10 million and multiplied the per capita appeals by 10,000. This transformation did not change the regression results in any way, however, which further suggests multicollinearity is not a problem.

Finally and most conclusively, the SAS computer program offers three collinearity diagnostic options: VIF, TOL, and COLLIN. The variance inflation option produces a measure of the inflation in the variance of each of the parameter

Table 3.12
Variance Inflation Factors

INTCPT	0.00	CIVILP	0.53
ELDERS	1.70	BANKP	0.65
BURG	6.20	TAKEPP	0.41
PCINC	0.13	AGE	0.68
DIV	0.69	T1	12.68
APPELP	0.32	T2	9.22
CRIMP	0.52	T3	7.62
		T4	3.61

estimates which is due to collinearities existing among the regressor variables. The TOL option reports the tolerance values for the parameter estimates so the parameters with the largest variance inflation factors have the least tolerance. The COLLIN option calculates the proportion of the variance of the estimate accounted for by each principal component. Multicollinearity is a problem when a component with a high condition index contributes strongly to the variance of two or more variables. Since the TOL and COLLIN results simply mirror the variance inflation factors, I did not report them.

Like any other multicollinearity diagnostic test, there are no formal criteria for deciding if a variance inflation factor is large enough to affect the predicted values. ELDERS and BURG have the largest variance inflation factor of all the demand variables but these are not large relative to similar examples in the SAS manual.[18] Even so, I ran the regression again to check, this time deleting both ELDERS and BURG but found the sign on CIVILP and the other demand variables remained the

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[18] SAS Institute, Inc., SAS/STAT Guide for Personal Computers, SAS Institute: Cary, NC, (1987), page 837.

same. Of the other variables, the dummy variables clearly have the most variance inflation. However, when I ran the regression omitting the dummy variables, the coefficients retained the same sign pattern and significance levels. Since the variance inflation factors are not high relative to other SAS examples and the regressions remain similar to Model 1A when possible collinear variables are deleted, I conclude that multicollinearity is not a problem. This means that since there is no multicollinearity, it is not justifiable to delete variables, and due to the fact that the CIVILP coefficient is negative, the only conclusion to fall from the demand variables is that any of the four models are possible.

The next question is to see how changes in all of the federal cases together affect the pass rate and if the effects of appellate, criminal, and bankruptcy cases dominate the civil caseloads. Table 3.12 shows the results from replacing the 4 individual federal caseload variables with FEDCASES, the sum of all federal cases. FEDCASES is negative but insignificant. Essentially, CIVIL cases swamps all other federal caseload variables rather than the other way around. But since the CIVIL sign is negative and more significant than the positive CIVIL variable, the two opposing causalies are washed out which makes the effect of FEDCASES insignificant. Clearly, separating out the effects of the federal caseload variables creates a much better test of the vintage model.

Since the time trends for the pass rate show the pass rate increasing until 1974 and decreasing after that, the following two regressions separate out the observations into two subsets: Model 1D being 1940-70 and Model 1E being 1980. As shown in

Table 3.13
Regression Results from Model 1C,
The Vintage Model Using FEDCASES instead of Individual
Federal Caseload Variables

Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	12	24382.36390	2031.86366	8.105	0.0001
Error	231	57907.32053	250.68104		
C Total	243	82289.68443			
R-square	0.2963				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	82.34	15.49	5.316***
ELDERS	0.073	0.48	1.514
BURG	5.41 X 10-8	0.40 x 10-7	1.218
PCINC	0.46	0.28	1.663*
URBAN	-0.13	0.095	-1.450
DIV	0.29 x 10-3	0.22 x 10-3	1.307
FEDCASES	-2.47	1.57	-1.570
TAKEPP	-101,340	18,000	-5.630***
AGE	-0.12	0.255	-0.494
T1	-12.40	8.77	-1.414
T2	-7.57	7.24	-1.045
T3	-6.51	6.50	-1.001
T4	-2.29	4.47	-0.512

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Tables 3.13 and 3.14, both subsets of observations mirror the preceding pooled regressions. The only difference for the 1940-70 regression is that the time dummies do not pick up the time series pass rate shifts and the other variables become less significant. In fact, PCINC loses its explanatory value entirely. Notedly, CIVILP remains negative in the 1940-70 subset. With only the 1980 observations, a new demand variable, the degree of urbanization (URBAN) is positive and quite significant further supporting the social welfare model. Interestingly, the CIVILP variable is insignificant which makes the 1980 regression consistent only with the social welfare model. In addition, the previous time series data showed the pass rate rising around 1980, further supporting the social welfare model.

The demand variables which have been used thus far were defined to be the actual number of cases on the federal level and as the actual level of each state proxyfor each decade. This is appropriate since the coefficients of each parameter reflect the change in the pass rate as a function of the changes in each parameter. Although it is not theoretically suggested by the vintage licensure model, it is possible to also conceptualize a relationship between changes in the pass rate to changes in the changes of the variables. Therefore, in Model 1F, I have run the regressions in a first difference sense which calculates the changes in the levels of each variable. I retained the same definition for the dummy variables so T2 = 1950, T3 = 1960, and T4 = 1970. Note that T1 becomes irrelevant since it is the base and 1940 data is now only used for calculating the 1950 changes. Notationally, the variable names remained the same with the exception that a DELT begins each variable name and

Table 3.14
Regressions Results from Model 1D,
The Vintage Model for 1940-70

Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	14	22087.71243	1577.69374	5.679	0.0001
Error	179	49724.84943	277.79245		
C Total	193	71812.56186			
R-square	0.3076				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	50.67	17.96	2.822***
ELDERS	0.16	0.068	2.309**
BURG	3.33 x 10-8	0.07 x 10-6	0.486
PCINC	0.48	0.34	1.397
URBAN	-0.13	0.12	-1.141
DIV	0.13 x 10-3	0.26 x 10-3	0.501
APPELP	33,789	83,789	0.403
CRIMP	12,960	6,931	1.870*
CIVILP	-9,157	3,684	-2.486***
BANKP	-4,209	2,572	-1.636
TAKEPP	-105,470	26,257	-4.017***
AGE	0.38	0.30	1.286
T1	-12.34	8.01	-1.541
T2	- 6.64	6.50	-1.021
T3	- 6.06	5.33	-1.138

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Table 3.15
Regressions Results from Model 1E,
The Vintage Model for 1980

Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	11	5327.04705	484.27700	5.958	0.0001
Error	37	3007.64683	81.28775		
C Total	48	8334.69388			
R-square	0.6391				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEP	78.12	29.98	2.606***
ELDERS	0.12	0.065	1.861*
BURG	-7.06 x 10-8	0.06 x 10-6	-1.117
PCINC	0.68	0.38	1.776*
URBAN	0.40	0.19	2.116**
DIV	0.0012	0.0010	1.176
APPELP	-86,802	54,487	-1.593
CRIMP	15,712	7,696	2.041**
CIVILP	1,261	6,772	0.186
BANKP	-1,529	3,500	-0.437
TAKEPP	-107,786	20,353	-5.296***
AGE	-0.85	0.76	-1.120

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Table 3.16
Regression Results from Model 1F,
The Vintage Model Using First Differences
with the Pass Rate as the Dependent Variable

Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	14	8168.13589	583.43828	2.152	0.0113
Error	177	47992.06724	271.14162		
C Total	191	56160.20313			
R-square	0.1454				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	92.22	6.77	13.629***
DELTELD	0.023	0.14	0.165
DELTBURG	-0.11 x 10-4	0.07 x 10-6	-1.508
DELTPCI	0.087	0.46	0.191
DELTURB	0.21	0.23	0.915
DELTDIV	0.28 x 10-4	0.57 x 10-3	0.050
DELTAPP	-26,496	62,342	-0.425
DELTCRIM	13,359	6,100	2.190**
DELTCIV	-2,366	3,411	-0.694
DELTBANK	732	3,516	0.208
DELTTAKE	-61,052	26,365	-2.316**
DELTAGE	0.13	0.22	0.598
T2	-22.07	5.75	-3.838***
T3	-21.34	7.25	-2.944***
T4	-8.00	5.15	-1.553

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

the first syllable of the previous variable name is retained. As two examples, ELDERS becomes DELTELD, and BURG becomes DELTBURG. The results appear below in Table 3.15 and show that this formulation of the model has little empirical value as well. Only the change in the number of applicants (DELTTAKE) and the change in the number of federal criminal cases (DELTCRIM) have any explanatory value. The DELTCRIM result supports the social welfare model while the DELTTAKE result supports either the social welfare or the rent seeking models.

As a slight variation, I also ran the regression in terms of how the change in the pass rate relates to changes in the variables. That is the same independent variables were used, but the change in the pass rate (DELTPR) is used as the dependent variable instead of PASSRATE. The results appear below in Model 1G as presented in Table 3.16. The change of the pass rate is affected by changes in burglary (DELTBURG), changes in per capita income (DELTPCI), and changes in civil caseload (DELTCIV). The DELTPR regression is a much better model in a statistical sense than the PASSRATE regression, however. The R-square values for the DELTPR regression are 23.43% while they are only 14.54% in the PASSRATE regression. Still, this formulation does not provide us with any additional ability for distinguishing between 4 vintage models.

To conclude, the tests of the vintage licensure model show the coefficients on ELDERS, the share of the elderly population, PCINC, the real per capita income of the entire state, and CRIMPP, the number of federal criminal cases per total state population to be positive. This provides strong support for the social welfare

Table 3.17
Regression Results from Model 1G,
The Vintage Model Using First Differences with the
Change in the Pass Rate as the Dependent Variable

Dependent Variable: DELTPR

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	14	13575.15694	969.65407	3.890	0.0001
Error	178	44373.50627	249.28936		
C Total	192	57948.66321			
R-square	0.2343				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	-1.57	3.65	-0.429
DELTELD	-0.0026	0.13	-0.020
DELTBURG	0.14 X 10-6	0.60 X 10-7	2.455***
DELTPCI	-0.18	0.37	-0.487
DELTURB	-0.16	0.20	-0.801
DELTDIV	-0.60 x 10-3	0.54 x 10-3	-1.089
DELTAPP	148,491	56,156	2.644***
DELTCRIM	19,162	5,304	3.612***
DELTCIV	-10,307	3,174	-3.247***
DELTBANK	-4,541	3,384	-1.342
DELTTAKE	-81,599	25,297	-3.226***
DELTAGE	-0.31	0.21	-1.460
T2	-0.31	0.21	-1.460
T3	9.88	5.31	1.861*
T4	3.89	4.72	0.825

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

maximization model since the sign of the change in the pass rate with respect to demand shifts is positive in the social welfare model but it is zero for the other three models. Unfortunately, however, due to the fact that CIVILP is negative in 2 regressions, the empirical results of suggest any of the four vintage licensure models are possible. Multicollinearity is not a problem so we can not justify omitting CIVILP nor does using the sum of all federal caseload variables instead of the 4 individual caseload measures eliminate this ambiguity. The variable TAKEPP (number of applicants, $\hat{N}_1$) is negative and very significant which is consistent with either a rent seeking or a social welfare model. The dummy varibles are significant and negative showing the pass rate rising over time, as expected given the time series data. The strong time series evidence supports the social welfare model. Combining the results from the 4 significant demand variables, TAKEPP, and the time series evidence together, we can conclude that while the vast majority of the evidence supports the social welfare maximization model, the rent seeking model is still possible since there is ambiguity from CIVILP and since a negative sign on TAKEPP is possible in rent seeking as well. Having one negative coefficient on CIVILP does not disprove the social welfare model, however, and all together, the social welfare model has the most support. Considering only the over all time trends for the pass rate, regression results from 1980 alone, and the first differences, though, we have only support for the vintage social welfare model.

Model 2

In addition to those variables suggested by the pure vintage occupational licensure model and contained in Model 1, there are other data which can be used to enrich this empirical work. The legal profession has several other methods by which it can control entry into its profession. It is entirely possible that the American Bar Association and its affiliated state bar organizations limit entry through influencing the number of positions available in law schools. We do not expect this to be as strong as it would be in the medical profession, though, since the American Medical Association explicitly controls the number of seats in medical classrooms. Unfortunately, data on the number of seats available in all of the law school by state is not available so this entry restriction mechanism is not measurable. There are data available, however, for two other methods of controlling entry into the legal profession. Some state bar associations allow admission by foreign motion. This is a form of courtesy admission provided to members of other state bar organizations which allow reciprocity for members of its bar. A state which admits a large percentage of its entrants by foreign motion should have lower pass rates since they have already admitted a large group of applicants of high quality. Bar associations also allow admission by diploma. Admission by diploma occurs when a state does not require an applicant to take an exam, but allows admission upon graduation from the state law school. Again, states which admit a large percentage of there entrants by diploma motion would have lower pass rates since they have already admitted a large group of applicants which they know to be of high quality since they attended the

required law school. Two variables have been created to capture these two affects: PCTDIP and PCTFOR. PCTDIP and PCTFOR are defined in percentage terms like the pass rate so their possible range of values is 0 to 100.

The share of women in the profession should also play a role in the legal profession's choice of the pass rate. Since the 1970s, the share of women applicants rose dramatically. This would be expected to decrease the pass rate since now twice as many good applicants would be available. The variable PCTFEM represents the percentage of female lawyers and judges in each state. However, I assume there is a one-to-one correlation between this variable and the percentage of female applicants.

In addition, it is of interest to see how the size of an applicant group's cohort affects the pass rate. The number of people who completed 4 or more years of college in the year which begins each decade are defined as the applicant's cohort. These are the individuals who are the same age as the law school applicants who, if they had the ability, could have gone to law school and taken the bar exam. I used the term COHORTPP to representing the size of this cohort per total state population. Controlling for the number of applicants and all other variables, as the variable COHORTPP rises, we expect the quality of the applicant pool to rise since there will be a larger group from which to take the best applicants. This implies the pass rate should fall. And finally, it is of interest to see how changes in the number of existing lawyers per capita (LAWPERPP) affect the pass rate. Economic intuition

suggests that as the number of pre-exising attorneys rises, they will admit fewer and the pass rate will fall.

The regression results from Model 2A appear below in Table 3.19. Here, interestingly, the variables ELDERS and PCINC which were significant and positive in model 1, become insignificant. The variable ELDERS is most correlated with the number of lawyers per total state population (LAWPERPP) but this correlation is

Table 3.18
Description of Variables Added in Model 2A

PCTDIP	=	The percentage of admissions by diploma. The number of admissions by diploma divided by total admissions. Possible range is 0 to 100.
PCTFOR	=	The percentage of admissions by foreign motion. The number of admissions by foreign motion divided by total admissions. Possible range is 0 to 100.
PCTFEM	=	The percentage of female lawyers and judges in the total legal population for each state.
COHORTPP	=	The number of persons who completed 4 or more years of college divided by total state population.
LAWPERPP	=	The number of attorneys existing in the legal market.

only 50.68% so multicollinearity would not likely explain the change. Similarly, PCINC is only 79.76% correlated with burglary and 71.38% correlated with LAWPERPP. Testing for this using the variance inflation factors or tolerance levels which appear in Table 3.20 below, we see that indeed multicollinearity is not a

problem again. And as would be expected since the variance inflation is not high, omitting the variable PCINC from Model 2A does not change the signs or significance of the variables.

CRIMP is again positive and significant in Model 2A, supporting the social welfare maximization model again. But also like in Model 1A, CIVILP is negative and significant, causing ambiguity and preventing us from drawing any conclusions from the demand variables again. Without multicollinearity, the ambiguous conclusion remands. Another problem is which arises is that the variable URBAN became negative and significant in Model 2A while it was insignificant in Model 1. TAKEPP remains negative, supporting either the social welfare or rent seeking models. Age remains insignificant. The variable AGE was again insignificant and, therefore, was not able to lend support to any of the four models. The signs of the time dummies remained the same, yet the magnitudes of their coefficients became larger.

The new variables PCTDIP and PCTFOR do contribute to the explanatory power of Model 2A and both are negative as expected. Changes in the number of female applicants (PCTFEM) and size of the cohort (COHORTPP) are insignificant. However, the variable LAWPERPP, the number of existing lawyers per capita, appeared to be positive and very significant. Since this variable was not predicted to have any influence on the pass rate from the vintage occupational licensure theory, we can not use the variable LAWPERPP to distinguish between the four models. The reason LAWPERPP ($\hat{N}_o$) does not have any comparative static implications is

Table 3.19
Regression Results from Model 2A,
Adding Additional Variables

Model: MODEL1
Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	39391.74573	1969.58729	10.239	0.0001
Error	223	42897.93869	192.36744		
C Total	243	82289.68443			
R-square	0.4787				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	112.58	15.79	7.131
ELDERS	0.037	0.051	0.729
BURG	3.85 x 10-8	0.4 x 10-7	0.963
PCINC	0.31	0.28	1.093
URBAN	-0.27	0.092	-2.913***
DIV	-0.25 x 10-4	0.21 x 10-3	-0.117
APPELP	-8,060	46,406	-0.174
CRIMP	15,676	5,178	3.027***
CIVILP	-5,475	2,947	-1.858*
BANKP	-2,506	1,951	-1.284
TAKEPP	-174,220	20,324	-8.572***
AGE	-0.17	0.23	-0.717
PCTDIP	-0.35	0.045	-7.737***
PCTFOR	-0.30	0.14	-2.088**
PCTFEM	-0.061	0.16	-0.389
COHORTPP	-88.34	99.24	-0.890
LAWPERPP	11,366	3,775	3.011***
T1	-25.64	8.30	-3.091***
T2	-14.86	6.81	-2.181**
T3	-21.14	6.60	-3.201***
T4	-10.39	4.38	-2.373**

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Table 3.20
Variance Inflation Factors for Model 2A

Variable	Tolerance	Variance Inflation
INTERCEPT	.	0.00000000
ELDERS	0.44563633	2.24398224
BURG	0.15748138	6.34995689
PCINC	0.10040928	9.95923907
URBAN	0.31402934	3.18441578
DIV	0.64620579	1.54749466
APPELP	0.29931173	3.34099835
CRIMP	0.48188371	2.07518947
CIVILP	0.46025383	2.17271412
BANKP	0.64072859	1.56072323
TAKEPP	0.25603491	3.90571739
AGE	0.65815181	1.51940629
PCTDIP	0.66317478	1.50789811
PCTFOR	0.80115520	1.24819761
PCTFEM	0.56939958	1.75623592
COHORTPP	0.33053633	3.02538609
LAWPERPP	0.19590851	5.10442359
T1	0.07246226	13.80028792
T2	0.10749910	9.30240375
T3	0.11262815	8.87877460
T4	0.25635485	3.90084291

that it is not a parameter in the vintage model. However, having more lawyers in the market means more new lawyers of higher quality are needed to raise average quality. Since this variable is positive and quite significant, it is consistent with either the social welfare or maintaining quality model since $d\bar{Q}/da_1 > 0$ in each.

Thus, adding these new variables to the vintage licensure model does not provide any additional empirical basis from which we can further distinguish between the four models.

It is possible that these results could be improved by combining the effects of TAKEPP and COHORTPP. As shown in Table 3.22 below, I replaced the variable TAKEPP with the ratio of the number of applicants and the number of cohorts (APPBYCOH). The results changed in a number of minor ways, but, unfortunately none of the changes improved our ability to distinguish between the four models.

Table 3.21
Description of the Variable Added in Model 2B

APPBYCOH = The ratio of the number of applicants (TAKEPP) to the size of the applicants' cohort (COHORTPP)

The only new variable to become significant was BANKP, although it is only slightly significant. The sign on BANKP is negative which only serves to create more ambiguity. URBAN became slightly less significant, CRIMP became slightly more significant. The variable which was added in this regression, APPBYCOH, was quite significant and positive. Finally, comparing the variables APPBYCOH and TAKEPP

themselves, we find that although both are significant and positive, TAKEPP is much more significant.

In addition to those variables considered in Model 2A and 2B, it is also possible that using data on ratio of the lawyer's wages to their next best alternative wages may provide some benefit. This data is considered separate from those variables introduced in Model 2A since it is available only for a subset of the test period.

Data is available on mean income of persons 18 years and over by years of school completed for the last three censi. However, the variable "years of school completed" is defined differently for each census year. In 1980, the data is defined in increments of 1 to 3 years, 4 years, 5 and 6 years, and 7 or more years. In 1970, the data is defined in increments of 1 to 3 years, 4 years, and 5 or more years, while in 1960 the data is defined only as 4 or more years. Since the variable of interest is the opportunity cost of going to law school, data on the mean income of 4 year college graduates is appropriate and it is this data which was collected for the years 1970 and 1980. The data is only provided separately for males and females so data on the number of and mean income for males and females was collected and the global income measure was calculated.

Table 3.22
Regression Results from Model 2B,
Replacing COHORTS by APPBYCOH

Model: MODEL1
Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	47114.71910	2355.73596	14.935	0.0001
Error	223	35174.96532	157.73527		
C Total	243	82289.68443			
R-square	0.5725				

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	93.22	13.42	6.948***
ELDERS	0.031	0.046	0.671
BURG	2.055 x 10-8	0.40x 10-6	0.567
PCINC	0.19	0.25	0.755
URBAN	-0.18	0.082	-2.201**
DIV	0.00015	0.20 x 10-3	0.776
APPELP	-23,373	41,396	-0.565
CRIMP	14,104	4,539	3.107***
CIVILP	-4,624	2,658	-1.740*
BANKP	-3,350	1,766	-1.896*
TAKEPP	-150,344	18,623	-8.073***
AGE	-0.087	0.21	-0.413
PCTDIP	-0.62	0.055	-11.148***
PCTFOR	-0.31	0.13	-2.359***
PCTFEM	-0.11	0.14	-0.799
APPBYCOH	0.0084	0.0012	7.066***
LAWPERPP	12,612	3,415	3.693***
T1	-33.72	7.53	-4.477***
T2	-16.10	6.17	-2.610***
T3	-24.24	5.77	-4.198***
T4	-11.43	3.92	-2.915***

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Data for the mean attorney earnings are calculated from the responses of 14,472 lawyers and judges who responded to the U.S. Census questionnaires and are included in the Public Use Microsample.[19]

We expect that as the earnings of college graduates rises, fewer people will enter law school and fewer will take the bar exams. Therefore, the ratio of lawyer's wages to their next best alternative wages should be directly correlated with the number of applicants (TAKEPP or $\hat{N}_1$). Therefore, the coefficient on the wage ratio should be negative in the social welfare, rent seeking, or maximizing quality models but zero in the maintaining quality model.

Table 3.23
Description of the Variable Added in Model 2C

WRATIO	=	The ratio of the mean of lawyers' wages to the mean wages of 4 year college graduates.

The results from Model 2C appear below in Table 3.24. This model has little to no benefit for distinguishing between the four possible models. Of the demand variables, only ELDERS is significant, although barely so, reappearing as positive and significant. TAKEPP is again negative, supporting either a social welfare or rent seeking model. All other variables are insignificant including the wage ratio. Thus

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[19] It is also possible to distinguish between male and female wages. This could be valuable since there is a differential female labor force participation and a gap between male and female wages. This is a point which will be pursued in future research.

Table 3.24
Regression Results from Model 2C,
Adding a Measure of Opportunity Costs
Dependent Variable: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	18	15080.65380	837.81410	3.143	0.0003
Error	74	19722.91609	266.52589		
C Total	92	34803.56989			
R-square		0.4333			

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	40.16	26.02	1.544
ELDERS	0.20	0.12	1.664*
BURG	0.21 x 10-6	0.13 x 10-6	1.604
PCINC	0.72	0.70	1.028
URBAN	-0.27	0.20	-1.361
DIV	-0.59 x 10-3	0.70 x 10-3	-0.852
APPELP	-158,926	231,844	-0.685
CRIMP	13,051	8,154	1.601*
CIVILP	503	22,134	0.023
BANKP	2,598	4,459	0.583
TAKEPP	-127,919	41,166	-3.107***
AGE	0.50	0.43	1.169
PCTDIP	-0.25	0.08	-3.094***
PCTFOR	-0.49	0.37	-1.337
PCTFEM	0.12	0.31	0.398
COHORTPP	-0.72 x 10-6	0.10 x 10-5	-0.790
LAWPERPP	657	7681	0.086
WRATIO	-860	689	-1.249
T4	-1.17	20.57	-0.057

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

adding the wage ratio offers no benefit for distinguishing between the four models and we remain with the conclusion that any of the four models is possible, although we have slightly more support for the social welfare model.

In addition, it is possible to argue that those who take the bar examinations have information about the differences in the difficulty of the different bar examinations across states. In this sense, the number who take the exam is endogenous. Knowledge of which states have difficult exams will discourage people from taking them. In fact, if the exam is a perfect testing instrument and the test takers' knowledge about its difficulty is perfect, the pass rate would be 100% since only those who know they will be able to pass the exam will take it. The pass rate, being the ratio of those that pass the exam and the number of examinees, may confound these two effects. Because of these factors, it is possible that the variable WRATIO itself may be a better dependent variable than the pass rate. Therefore, considering WRATIO to be the dependent variable instead of the PASSRATE is considered below in Table 3.25. Unfortunately, however, this regression has little value for distinguishing between the vintage models. The divorce rate does appear to be significant and positive in its relationship to the wage ratio, however, none of the previously significantly positive variables appear. Further, the CIVILP variable which had occasionally been negative before is now insignificant, but BANKP has emerged as negative and significant. Therefore, we conclude that none of the variables which we have added to the vintage licensure model in Model 2 (PCTDIP, PCTFOR, LAWPERPP, WRATIO, either as a dependent or independent variable,

Table 3.25
Regression Results from Model 2D,
Using the WRATIO as the Dependent Variable

ANALYSIS OF VARIANCE

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
MODEL	15	0.000365737	0.000024382	5.600	0.0001
ERROR	82	0.000357029	.00000435401		
C TOTAL	97	0.000722766			
R-SQUARE		0.5060			

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	0.0037	0.0038	0.987
ELDERS	-0.37 x 10-5	0.12 x 10-4	-0.313
BURG	-1.17 x 10-11	9.43 x 10-12	-1.242
PCINC	-0.72 x 10-4	0.62 x 10-4	-1.161
URBAN	-0.90 x 10-4	0.32 x 10-4	-0.284
DIV	5.72 x 10-7	1.51 x 10-7	3.789***
APPELP	-6.52	10.01	-0.651
CRIMP	0.35	1.50	0.23
CIVILP	0.028	1.39	0.020
BANKP	-0.89	0.44	-2.010**
APPBYCOH	-100,382	204,564	-0.491
AGE	0.21 x 20-4	0.81 x 10-4	0.257
T4	0.0038	0.88 x 10-3	4.286***
PCTDIP	0.48 x 10-5	0.13 x 10-4	0.372
PCTFOR	-0.98 x 10-5	0.44 x 10-4	-0.221
LAWPERPP	1.55	0.77	2.009**

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

COHORTPP, and APPBYCOH) provide any additional information which we can use to further distinguish between the four models.

Model 3

Although lawyer's income does not have comparative statics results in the vintage licensure model, as in the single equation regression in Model 2D, we expect there must be a direct relationship between the pass rate and the legal profession's earnings. We also expect that these legal earnings themselves are dependent on the same variables which determine the pass rate. Therefore, it is appropriate to construct a set of simultaneous equations which includes this information. The system of equations suggested by the theory and described below is:

PASS RATE	=	EARN, PCTDIP, PCTFOR, PCTFEM, TAKEPP, LAWPERPP, AGE, DEMAND VARIABLES
EARN	=	PCTCNHAT, TAKEPP, LAWPERPP, AGE, DEMAND VARIABLES

where the underlined variables are variables which appear in one equation but not the other. Variables typed with standard typeface appear in both equations.

The two new variables which are included in Model 3 are EARN and PCTCNHAT. EARN is the mean earnings of the 14,472 lawyers and judges who responded to the U.S. Census questionnaires and are included in the Public Use Microsample. The variable PCTCNHAT is the product of the percentage of civil cases in each state and the variable TAKEPP ($\hat{N}_1$). The reason this variable is included is that the percentage of civil cases captures the price sensitivity of the legal

work since civil caseload is the most elastic of the four types of legal cases. The variable TAKEPP proxies shifts in the supply curve since the supply curve is vertical in the vintage model. Thus, as the product of PCTC and TAKEPP increases (PCTCNHAT), since this is the product of the most elastic form of demand and supply shifts, the earnings should rise more rapidly than they would with other legal work, and the coefficient on PCTCNHAT should be positive.

Table 3.26
Summary of Variables Added in Model 3

EARN	=	The mean of the earnings from salaries and wages of all judges and lawyers who responded to the U.S. Census' questionnaires and are included in the Public Use Microsample.
PCTCNHAT	=	The product of the percentage of civil cases and the number of applicants.

It should also be noted that the variable APPELP happened to be a linear combination of EARN and some other variables.[20] When SAS encounters such a linear combination, it recalculates the regression omitting the linearly combined variable. Therefore, the results reported in Table 3.27 below omit APPELP.

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[20] Specifically, SAS reports that TAKEPP = -0.003427*INTERCEP+1.7 x 10-5*EARN + 1.4 x 10-5PCTFEM + 8.0 X 10-7*PCTDIP - 1.3 X 10-5*PCTFOR - 0.275556*LAWPERPP + 3.3 X 10-5*AGE +6.7 X 10-6*ELDERS + 2.2 X 10-5*PCINC - 6.1 X 10-6*URBAN - 1.2*10-8*DIV + 0.29335*CRIMP - 0.104158*CIVILP + 0.0239195*BANKP - 0.001834*T1 + 0.00011106*T2 + 7.4 X 10-4*T3 + 1.3 X 10-4*T4. This, according to Dr. G.S. Maddala, is not an unusual situation when regressions contain as many independent variables as mine do.

Table 3.27
Regression Results from Model 3
2SLS Estimation of Simultaneous Equations

MODEL: EQU 1 Second Stage
DEP VARIABLE: PASSRATE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
MODEL	19	41127.95366	2164.62914	8.876	0.0001
ERROR	219	53406.88647	243.86706		
C TOTAL	238	83280.43515			
R-SQUARE		0.4351			

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0
INTERCEPT	65.14	112.46	0.579
EARN	0.16	0.54	0.302
PCTFEM	0.25	0.48	0.515
PCTDIP	-0.32	0.058	-5.642***
PCTFOR	-0.49	0.44	-1.117
TAKEPP	-152,578	37,368	-4.083***
LAWPERPP	5,686	9,842	0.578
AGE	0.66	1.12	0.589
ELDERS	0.085	0.22	0.382
BURG	1.11 x 10-09	1.07 x 10-07	0.010
PCINC	0.31	0.78	0.392
URBAN	-0.25	0.22	-1.134
DIV	0.22 x 10-3	0.00051	0.435
CRIMP	15,250	11,146	1.368
CIVILP	-10,812	4,649	-2.326**
BANKP	-3,480	2,310	-1.506
T1	-57.18	60.04	-0.952
T2	-15.59	36.40	-0.428
T3	-21.49	24.56	-0.875
T4	-12.98	6.17	-2.104**

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Table 3.27, Cont.
Regression Results from Model 3
2SLS Estimation of Simultaneous Equations

MODEL: EQU 2 Second Stage
DEP VARIABLE: EARN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	PROB>F
MODEL	16	1223718.12	76482.38247	36.198	0.0001
ERROR	222	469063.83	2112.90015		
C TOTAL	238	1675172.86			
R-SQUARE		0.7229			

Parameter Estimates

Variable	Parameter Estimate	Standard Error	T FOR H0: Parameter=0
INTERCEPT	170.51	54.93	3.104***
PCTCNHAT	971,290,185	2,054,194,590	0.473
TAKEPP	-328,431	788,180	-0.417
LAWPERPP	7,926	22,822	0.347
AGE	-1.84	0.82	-2.232**
ELDERS	-0.38	0.17	-2.286**
BURG	-1.48 X 10-07	1.23 X 10-07	-1.196
PCINC	-0.71	1.09	-0.650
URBAN	0.42	0.34	1.234
DIV	0.78 X 10-3	0.11 X 10-2	0.698
CRIMP	11,382	64,554	0.176
CIVILP	-26,738	58,844	-0.454
BANKP	17,972	43,458	0.414
T1	140.67	31.82	4.420***
T2	-52.80	13.35	-3.955***
T3	-28.03	18.91	-1.482
T4	0.35	12.40	0.028

NOTE:
* t>1.645, at least at the 95.0% level of significance.
** t>1.960, at least at the 97.5% level of significance.
*** t>2.326, at least at the 99.0% level of significance.

Including APPELP with EARN in this system would violate the rank condition which would in turn bias the estimates.

As the results in Table 3.27 show, the estimation results from a simultaneous estimation of these two equations do not provide any additional information to the regressions of Model 1 nor do they help to distinguish between the four possible models. The only variable to be significant and related to the vintage model from the first equation is CIVILP. However, the sign on the coefficient is negative as it was in Model 1 so it can not be used to distinguish between the four models. The other significant variables are consistent with economic intuition, but irrelevant to the vintage model.

Conclusions

The existing empirical literature offers little to explain the choice of the pass rate in self licensed professions and no previous articles use the pass rate to discern between possible motivating the professions' behavior. Therefore, this thesis contributes to the existing literature by providing an examination of the pass rate over time and in cross section designed to distinguish between 4 possible models of occupational licensure behavior.

The time series of pass rates in the legal profession provides evidence supporting the social welfare model since the pass rate has generally risen over time. A rising pass rate is only consistent with the social welfare model while a falling pass rate is consistent with either a rent seeking, social welfare, or quality maximization

model. Therefore, the time series evidence on pass rates form 1932 to 1974 supports only the social welfare model. Although the falling pass rates since 1974 still are consistent with the social welfare model, this shift could also indicate a change in behavioral objectives and make either the rent seeking or quality maximization models theoretically possible. All together, though, the time series evidence points strongly to the social welfare model.

In several cross section regressions of the 50 states for the census years from 1940 to 1980, I turn to the central empirical question of this chapter, that is, how does the pass rate ($1\text{-}F(a_1)$) change with changes in the demand shift parameter (α), the number of applicants ($\hat{N}_1$), and the depreciation rate (δ)? The fact that there were 3 demand variables (ELDERS, PCINC, and CRIMP) which were positive and significant provides support for the social welfare model. Unfortunately, however, a significantly negative sign on CIVILP was also observed. Since the social welfare model only predicts a positive sign and no other comparative statics predicted a minus sign, we have to conclude that any model is possible. Using the variable TAKEPP ($\hat{N}_1$) allowed us to narrow the field of possible models from four to three: rent seeking, social welfare, or maximizing quality since the coefficient on TAKEPP can be negative in either of the three models. Many other variables were used to try to increase the explanatory power of the model, but to no avail. The overall conclusion from the cross section work is that either social welfare, rent seeking, or maximizing average quality objectives could have motivated United States' lawyers behavior for the period 1940 to 1980. When we tie the cross section and time series

results together, though, the scale is tipped slightly in favor of the social welfare model due to the strong time series pattern of rising pass rates.

CHAPTER IV
CONCLUSIONS

There is a limited theoretical literature on licensed professions. The only published licensure paper which deals with how a profession chooses its entrants is Hayne Leland's 1979 quacks model, a one-period application of the lemons model to licensed professions. In this dissertation, I presented a new two-period, vintage model of licensure. My model is similar to Leland's model since I examine the social welfare implications of choosing the worst professional's quality through self-regulation versus government-regulation. My model differs from Leland's model, though, since my two-period model distinguishes between old and new professionals. Developing a two-period model allowed me to focus on the old professionals' profit which arguably is the correct objective function to pinpoint. My model is also more general since I do not initially impose the uniform quality distribution characteristic of lemons markets.

Ultimately, the goal in this dissertation was to derive a model which allows for testable differences between social welfare and rent maximizing models -- a feature which further distinguishes this dissertation from the existing literature. In turn, the purpose behind the subsequent empirical work was to test these theoretical differences if they arise.

The only two empirical papers which specifically deal with how a profession chooses its entrants claim and are commonly cited as proof that licensed professions act as cartels. The possibility that quality variations could occur is overlooked which makes their results only suggestive. In addition, neither of these two papers model the professions behavior of choosing the entrants based on their quality directly and thus are not directly testable like the vintage model.

The time series of pass rates in the legal profession provides evidence supporting the social welfare model since the pass rate has generally risen over time. A rising pass rate is only consistent with the social welfare model while a falling pass rate is consistent with either a rent seeking, social welfare, or quality maximization model. Rising pass rates from 1932 to 1974 supports only the social welfare model. Falling pass rates since 1974 are still consistent with the social welfare model, this but also make either the rent seeking or quality maximization models conceiveable. All together, though, the time series evidence points strongly to the social welfare model.

In several cross section regressions of the 50 states for the census years from 1940 to 1980, I examine how the pass rate ($1\text{-}F(a_1)$) changes with changes in the demand shift parameter (α), the number of applicants ($\hat{N}_1$), and the depreciation rate (δ)? The fact that there were 3 demand variables (ELDERS, PCINC, and CRIMP) which were positive and significant provides support for the social welfare model. Unfortunately, however, a significantly negative sign on CIVILP was also observed. Since the social welfare model only predicts a positive sign and no other comparative statics predicted a minus sign, we have to conclude that any model is

possible. Using the variable TAKEPP ($\hat{N}_1$) allowed us to narrow the field of possible models from four to three: rent seeking, social welfare, or maximizing quality since the coefficient on TAKEPP can be negative in each of the three models. Many other variables were used to try to increase the explanatory power of the model, but to no avail. The overall conclusion from the cross section work is that either social welfare, rent seeking, or maximizing average quality objectives could have motivated United States' lawyers behavior for the period 1940 to 1980. When we tie the cross section and time series results together, though, the scale is tipped slightly in favor of the social welfare model due to the strong time series pattern of rising pass rates.

APPENDIX A
PROOFS

Proof of (2.31)

First, simplify (2.21) using the fundamental theorem of integral calculus and the fact that F(b) = 1, so

$$\int_{a_1}^{b} f(q)dq = 1 - F(a_1)$$

therefore

$$\bar{q}_1 = \frac{\int_{a_1}^{b} q\, f(q)dq}{1 - F(a_1)} \qquad (2.21')$$

Taking the derivative of $\bar{q}_1$ with respect to a_1, we have

$$\frac{d\bar{q}_1}{da_1} = \frac{-a_1 f(a_1)}{1 - F(a_1)} + \frac{f(a_1)\int_{a_1}^{b} qf(q)dq}{[1 - F(a_1)]^2} = \frac{f(a_1)\left[\int_{a_1}^{b} qf(q)dq - a_1 + a_1F(a_1)\right]}{[1 - F(a_1)]^2} \qquad (2.31')$$

When integrating by parts, $\int_x^y udv = uv\,]_x^y - \int_x^y vdu$, so if q = u and f(q)dq = dv, then integrating $\int_{a1}^{b} qf(q)\,dq$ by parts gives

$$\int_{a_1}^{b} qf(q)dq = qF(q)]_{a_1}^{b} - \int_{a_1}^{b} F(q)dq = bF(b) - a_1F(a_1) - \int_{a_1}^{b}F(q)dq$$

The F(b) drops out of this expression since F(b) = 1. Substituting this simplified integral back into (2.31') we have

$$\frac{d\bar{q}_1}{da_1} = \frac{f(a_1)\left[\, b - a_1F(a_1) - \int_{a_1}^{b}F(q)dq - a_1 + a_1F(a_1) \,\right]}{[1 - F(a_1)]^2}$$

Since $b - a_1 = \int_{a1}^{b} dq$

$$\frac{d\bar{q}}{da_1} = \frac{f(a_1)}{[1 - F(a_1)]^2}\left[\, \int_{a_1}^{b}dq - \int_{a_1}^{b}F(q)dq \,\right] = \frac{f(a_1)}{[1 - F(a_1)]^2}\int_{a_1}^{b}[1 - F(q)]dq$$

which is the first equality of (2.31). For the second equality of (2.31), (2.31') can be rewritten as

$$\frac{d\bar{q}_1}{da_1} = \frac{-a_1f(a_1)}{1 - F(a_1)} + \frac{f(a_1)}{1 - F(a_1)}\left(\frac{\int_{a_1}^{b} qf(q)dq}{1 - F(a_1)}\right)$$

But due to (2.21'), this simplifies to

$$\frac{d\bar{q}_1}{da_1} = \frac{-a_1f(a_1)}{1 - F(a_1)} + \frac{f(a_1)}{1 - F(a_1)}\,\bar{q}_1$$

which gives the second equality of (2.31) directly.

Proof of (2.33)

$$\frac{d[\ \delta N_o(\bar{q}_o - a_1) + N_1(\bar{q}_1 - a_1)\ ]}{da_1} = -\delta N_o + N_1\left[\frac{d\bar{q}_1}{da_1} - 1\right] + (\bar{q}_1 - a_1)\frac{dN_1}{da_1}$$

Substituting in the second equality for $d\bar{q}/da_1$ from (2.31) we have that

$$\frac{d[\ \delta N_o(\bar{q}_o - a_1) + N_1(\bar{q}_1 - a_1)\ ]}{da_1} = -\delta N_o - N_1 + \hat{N}_1[(\bar{q}_1 - a_1)f(a_1)] - (\bar{q}_1 - a_1)f(a_1)\hat{N}_1$$

or

$$\frac{d[\ \delta N_o(\bar{q}_o - a_1) + N_1(\bar{q}_1 - a_1)\ ]}{da_1} = -\delta N_o - N_1 < 0$$

APPENDIX B
DATA SOURCES

Table B.1
Data Sources

VARIABLE	DEFINITION	SOURCE
ADMISSIONS BY EXAMINATION	Number admitted by examination	American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 88. American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 20
AGE	Mean age of lawyers & judges within each state. Calculated from 14,472 individual observations. Note: The original age variable in the original observations were truncated at 90.	U.S. Census, Census of Population Housing, 1980, 1970, 1960, 1950, and 1940, Public Use Microsample.
APPEALP	Appeals filed in the United States Circuit Courts of Appeal during the fiscal year per total state population.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administration Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).

VARIABLE	DEFINITION	SOURCE
BANKP	Number of bankruptcy cases commenced in U.S. District Courts during the fiscal year/total state population.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administration Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).
BURG	The original data reported is the number of offenses known to police/100,000 inhabitants. This was rescaled in terms of number of known burglaries/total state population.	U.S. Federal Bureau of Investigation, Uniform Crime Reports. Data appears in various tables.
CIVILP	Civil cases commenced in the United States District Courts during the fiscal year per total state population.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administration Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).
COHORTPP	Cohort of the applicant group. Number of persons who completed 4 or more years of college per total state population.	U.S. Bureau of the Census, Statistical Abstract of the United States.
CONSUMER PRICE INDEX	Consumer price index.	U.S. Bureau of the Census, Statistical Abstract of the United States, 1981.

VARIABLE	DEFINITION	SOURCE
CRIMP	Criminal cases commenced in the United States District Courts during the fiscal year per total state population.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administrative Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).
DIV	The original variable was reported as the number of divorces/ 1000 population. This was rescaled to the number of divorces/total state population.	U.S. National Center for Health Statistics, Vital Statistics of the United States. Data appears in various tables.
DELTAPP	The change in the number of appeals filed per total state population over the previous decade.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administration Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).
DELTBANK	The change in the number of bankruptcy cases commenced in U.S. District Courts/total state population per fiscal year over the past decade.	Director of the Administrative Office of the United States Courts (1941-90), Annual Report of the Director of the Administration Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).
DELTBURG	The change in the number of burglary offenses known to police per total state population on an annual basis. The change is relative to the number/fiscal year observed in the previous census year.	U.S. Federal Bureau of Investigation, Uniform Crime Reports, Data appears in various tables.

VARIABLE	DEFINITION	SOURCE
DELTCIV	The change in the number of civil cases commenced in the U.S. District Courts per total state population on an annual basis. The change is calculated relative to the number per fiscal year observed in the previous census year.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administration Office of the United States Courts, Washington, DC: US Government printing Office (data appears annually in various tables).
DELTCRIM	The change in the number of criminal cases commenced in the U.S. District Courts per fiscal year over the past decade.	Director of the Administrative Office of the United States Courts (1941 - 1990), Annual Report of the Director of the Administrative Office of the United States Courts, Washington, DC: US Government Printing Office (data appears annually in various tables).
DELTDIV	The change in the number of divorces reported per total state population on an annual basis over the past decade.	U.S. National Center for Health Statistics, Vital Statistics of the United States. Data appears in various tables.
DELTELD	Change in the number of people aged 65 and older per total state population over the past decade.	U.S. Census, U.S. Census Reports, 1940-80. Data appears in various tables.
DELTINC	Change in the mean, real per capita income of the residents of each state over the past decade.	U.S. Bureau of Economic Analysis, Survey of Current Business. Data appears in various tables.
DELTURB	Change in the % of population living in area of 2500 or more, or change in the % urbanized.	U.S. Bureau of the Census, U.S. Census, 1940, 1950, 1960, 1970, and 1980. Data appears in various tables.

VARIABLE	DEFINITION	SOURCE
EARN	14,472 observations of personal wage and salary for lawyers & judges were used to calculate the mean lawyers' earnings for each state. Note: The original observations were truncated at $75,000.	U.S. Census, Census of Population and Housing, 1980, 1970, 1960, 1950, and 1940 Public Use Microsample.
ELDERS	Number of people of age 65 and older per total state population.	U.S. Census, U.S. Census Reports, 1940-80. Data appears in various tables.
LAWPERPP	number of lawyers. Defined as sum of Martindale-Hubbell "Directory Listings" and "Lawyers not Listed" minus one-half of "Multiple Listings" per total state population.	American Bar Foundation (1972), 1971 Lawyer Statistical Report Chicago, IL: American Bar Foundation, p. 21. American Bar Foundation (1985), The Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 4.
PASSRATE	Number admitted on examination per number of examinees time 100%. This variable, therefore, could potentially range from 0 to 100. Values are distributed across the interval and are not clustered at either end of the interval.	American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 88. American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 20
PCINC	Mean real per capita, income ($) of the residents of each state.	U.S. Bureau of Economic Analysis, Survey of Current Business. Data appears in various tables.

VARIABLE	DEFINITION	SOURCE
PCTAGE	The percentage of lawyers aged 65 and older. This variable is constructed from the 14,472 individual observations. Note: The original age variable in each of the original observations in the Public Use Microsample was truncated at 90.	U.S. Bureau of the Census, Public Use Microsample, 1940 through 1980.
PCTDIP	Number admitted with a diploma divided by total number admitted, or the percentage diploma admissions.	American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 88. American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 20
PCTFEM	Percentage of female lawyers and judges in the total legal population for each state.	U.S. Bureau of the Census, U.S. Public Use Microsample, 1940 to 1980.
PCTFOR	Number admitted on foreign motion divided by total number admitted, or the percentage foreign admissions.	American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 88. American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 20

VARIABLE	DEFINITION	SOURCE
POPULATION	Population estimates, as of July 1, for residents within each state.	U.S. Bureau of the Census (1989) Statistical Abstract of the U.S. Washington, DC: U.S. Bureau of the Census, p. 7.
SEX	This variable is a dummy variable for sex defined as a 1 if female, as a 0 if male used in calculating the percentage of female lawyers.	U.S. Census, Census of Population and Housing, 1980, 1970, 1960, 1950, and 1940 Public Use Microsample.
TAKEPP	Number taking bar examination for the first or second time per total state population.	American Bar Foundation (1962), 1961 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 88. American Bar Foundation (1972), 1971 Lawyer Statistical Report, Chicago, IL: American Bar Foundation, p. 20
T1-T4	Dummy variables constructed to represent the years 1940through 1980. The dummy is defined so T1 = 1 if 1940, otherwise T1 = 0. Likewise, T2 is for 1950, T3 is for 1960 and T4 is for 1970.	Constructed variable.
URBAN	% of population living in places of 2500 or more.	U.S. Bureau of the Census, U.S. Census, 1940, 1950, 1960, 1970, and 1980. Data appears in various tables.

VARIABLE	DEFINITION	SOURCE
WRATIO	The ratio of the mean of lawyers' wages to the mean wages of 4 year college graduates. The mean lawyers' wages within each state were calculated from Public Use Microsample data. The 4 year college graduates' wage data came from the standard censi data.	U.S. Bureau of the Census, Public Use Microsample, 1940 - 1980. U.S. Bureau of the Census, U.S. Census, (1970), Table 197, (1980), Table 237.

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BIOGRAPHICAL SKETCH

Marcelle Anne Guira, the eldest child of Thomas and Enid Kinney, was born on October 7, 1959, in Milwaukee, Wisconsin. In October 1967, her family moved to Florida where she has lived ever since. Since graduating from high school in 1977, she has lived in Gainesville, Florida. While in Gainesville, Marcelle met her husband, Jorge Manuel Guira, and married him on July 3, 1986, in Atlanta, Georgia.

Marcelle earned a B.S. in chemistry, a B.A. in economics, a M.A. in economics, and finally a Ph.D. in economics from the University of Florida. She has been employed by the Economics Departments at the University of Florida and at Florida State University, Florida's Tax and Budget Reform Commission, and AT&T Communications. She plans to continue her academic research studying public policy issues.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Steven M. Slutsky, Chairman
Associate Professor of Economics

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This dissertation was submitted to the Graduate Faculty of the Department of Economics in the College of Business Administration and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

May 1992

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